THE SILURIAN RUGOSA OF THE YASS-BOWNING DISTRICT, N.S.W.

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(Plates xi–xiii; four Text-figures.)

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In this paper eighteen species of Rugosa already described from the Yass-Bowning district are revised, and two genera and four species are described as new. Discussions are included of the families and genera involved. The age indicated by the Rugosa is Silurian, probably Upper Wenlock (Wenlock Limestone), and perhaps also Lower Ludlovian.

The Rugosa were collected chiefly from two localities, (1) Yass River, at Hatton's Corner, near Yass, and (2) Derrengullen Ck. and its tributary Limestone Ck., near Bowning. The lithological succession at both these localities has long been known; most of the corals have already been described by Etheridge, and some have more recently been revised by Jones. At Hatton's Corner, the Bowspring Limestone, up to 100 feet thick, is overlain by the Barrandella shales (about 70 feet thick), and these are followed by the Hume Limestone (20 feet). Further shales overlie the Hume Limestone, and are in turn overlain by the Phacops bed of very impure limestone of Rainbow Hill (Shearsby, 1912). For the Bowning district, the following succession at Bowning was given by Mitchell (Sussmilch, 1922, p. 36):

Conglomerates at top (tuffaceous matrix).
Shales and sandstones.
Conglomerates.
Shales and sandstones
Shales, sandstones, conglomerates } i.e. Upper Trilobite Bed.
Shales, i.e. Great Shale (Graptolites on west).
Limestone, impure (with trilobites), i.e. Middle Trilobite Bed.
Shales (with corals and crinoids), i.e. Lower Trilobite Bed (Graptolites on east).
Limestones (corals, brachiopods).
Grits at base.

Silurian graptolites from Silverdale near Bowning have recently been described (Sherrard and Keble, 1937, p. 306) as from the Lower Trilobite Bed[1] of Mitchell. Detailed field mapping of the sediments in the Silurian Yass-Bowning syncline is at present being undertaken by Dr. Ida Brown, Mr. A. J. Shearsby and members of the Geology Department of the University of Sydney. The Rugosa from a small outcrop of Silurian beds along the western bank of the Murrumbidgee between the Boambolo crossing and the Taemas Bridge are also recorded, one

[1] Sherrard and Keble have since considered (*in litteris*) that these graptolites may have come from the sandstone at the top of the Great Shale, where Mitchell collected *Orthis* and *Atrypa*.

new species being described. These beds are regarded as approximately of the same age as the Hatton's Corner beds.

The Rugose corals described herein are listed below, together with the Heliolitidae and the massive *Favosites*. Where any horizon at Hatton's Corner has been verified by me for these species, suitable letters are placed after them as follows: B.L. = Bowspring Limestone; B.S. = Barrandella Shale; H.L. = Hume Limestone; H.S. = Shales over Hume Limestone; P.B. = Phacops Bed of Rainbow Hill.

Ampleximorphs.

Pycnostylus congregationis (Etheridge), B.S.
dendroides (Etheridge), B.S.

Family Calceolidae.

Rhizophyllum interpunctatum de Koninck, B.S.
robustum Shearsby.
yassense Shearsby.

Cystimorphs.

Cystiphyllum sp. cf. *bohemicum* Pocta, B.L.
Holmophyllum multiseptatum, n. sp.

Family Disphyllidae.

Disphyllum praecox, n. sp., B.L.

Family Mycophyllidae.

Mycophyllum crateroides Etheridge, B.S.
liliiforme (Etheridge), B.S.

Family Pycnactidae.

Hercophyllum shearsbyi (Sussmilch), B.S.
Baeophyllum colligatum, n. gen. et sp., B.L.

Family Rhabdocyclidae.

Tryplasma delicatulum Etheridge.
derrengullenense Etheridge.
lonsdalei Etheridge, B.S.

Family Spongophyllidae.

Spongophyllum shearsbii Chapman, B.L., B.S.
spongophylloides (Foerste), B.L., H.L.
Yassia enormis (Etheridge), B.L.

Family Streptelasmidae.

Streptelasma australe (Foerste), P.B.

Family Entelophyllidae.

Entelophyllum latum, n. sp.
yassense (Etheridge), B.S., H.L.
yassense var. *patulum* (Foerste).

Rugosa Incertae Sedis.

Zenophila walli (Etheridge), B.S., H.L., H.S.

Heliolitidae.

Heliolites daintreei Nicholson and Etheridge, B.L.
Plasmopora heliolitoides Lindström. B.L.
gippslandica (Chapman).
Propora conferta Edwards and Haime, B.L.

Massive *Favosites*.

Favosites allani Jones, B.S.
gothlandicus forma *gothlandica* Lamarck. B.L., B.S.
libratus Jones.
regularis Jones, B.L., B.S.
richardsi Jones, B.S.
triporus Walkom, B.L., B.S.
yassensis Jones, B.S., H.L.

The Heliolitidae are described by Jones and Hill (1940), and the massive *Favosites* have been studied by Jones (1937). *Coenites intertextus* Etheridge, *Striatopora* and *Syringopora* also occur in the Yass district, while *Halysites* sp. is known from a quarry near Bango.

The Age of the Fauna.—Pycnostylus is known from the Guelph (Lower Ludlow) of Canada, and possibly from the Middle Devonian of Germany. *Rhizophyllum* ranges in Europe from the Wenlock to the Lower Devonian; *R. robustum* particularly is like *R. gotlandicum* from the Wenlock and Ludlow of Europe. *Cystiphyllum* sp. and *Holmophyllum multiseptatum* are comparable with European Wenlock and Ludlow forms. *Disphyllum* occurs elsewhere only in the Devonian. *Mycophyllum* has species comparable with ours in the Wenlock and Ludlow of Europe. *Hercophyllum* is very similar to *Lykophyllum westergardi* from the Stricklandinia marls (basal Wenlock) of Gotland. *Baeophyllum* may be like the Ludlow *Entelophyllum fasciculatum* from Gotland, or *Amplexus cingulatus* from the Niagaran of Quebec. *Tryplasma* has species comparable with ours in the Wenlock and Ludlow of Europe. *Spongophyllum spongophylloides* is comparable with the Wenlock (E_2) *S. inficetum* from Bohemia. *Yassia* is unknown elsewhere. *Streptelasma* is a very long-ranged genus, Upper Ordovician to Middle Devonian. *Entelophyllum* is Niagaran in America and Wenlock and Ludlow in Europe. *Zenophila* is not known elsewhere. The Rugosa thus prove a

Silurian age, nearly all forms having Wenlock and Ludlow affinities. This accords with evidence from the Silverdale graptolites (Sherrard and Keble, 1937, p. 307), which indicate for the bed containing them a horizon somewhere between the base of the Wenlock and the top of the Lower Ludlow. The narrowest comparisons that I can make are *Cystiphyllum* sp. to a Lower Ludlow form, *M. crateroides* to an Upper Wenlock specimen, *H. shearsbyi* to a basal Wenlock species, *B. colligatum* to a Ludlow specimen, and *S. spongophylloides* to an E_2 (approximately Wenlock limestone or Lower Ludlow) form. These suggest to me that the fauna represents the top of the Wenlock and perhaps also the base of the Ludlow.

The fauna contains Calceolidae, Cystimorphs, Pycnactidae, Rhabdocyclidae, Streptelasmidae and Entelophyllidae in common with the Wenlock Limestone of England, but *Arachniophyllum* and *Spongophylloides*, so characteristic in England, are lacking, and *Cystiphyllum*, common in England, is very rare at Yass, while the Amplexímorphs, *Disphyllum*, Mycophyllidae and Spongophyllidae, which form an important part of the Yass fauna, are not known in England. These differences appear to have a geographical rather than a time value, for Amplexímorphs, Mycophyllidae and Spongophyllidae occur in the Wenlock and Ludlow elsewhere in Europe. Disphyllidae are unknown elsewhere below the Devonian, of which they are characteristic.

Amplexímorphs.

Amplexímorphs are solitary or fasciculate Rugose corals which have thin walls, short lamellar septa and complete tabulae, and are without dissepiments.

Such corals could be the end-points of many different lineages, or trends in simplification. The absence of dissepiments is shared with the Rhabdocyclidae and the Mycophyllidae, but both these families have rhabdacanths in their septa, whereas in amplexímorphs the septa are lamellar and attenuate and short; only in rare instances may individual trabeculae be distinguished.

The Carboniferous *Amplexus* Sowerby, the Devonian *Cyathopaedium* Schlüter and *Cylindrophyllum* Yabe and Hayasaka, and the Silurian *Pycnostylus* Whiteaves and *Tabularia* Sochkina are regarded as among the amplexímorphs, and an examination of topotypes of all their genotypes would be needed for a proper understanding of their relations. Weissermel (1939, p. 14, 23) has recently made an important contribution by giving descriptions of the structure of the walls and septa in several forms, e.g. *Cyathopaedium paucitabulatum* (Schlüter). He has considered *Fletcheria* Edwards and Haime, from the Silurian of Gotland and Antirovitha, a genus which has many of the characters of amplexímorphs, to belong to the Tabulata and not to the Rugosa, as the structure of the walls and the nature of the septa is that of *Syringopora* or *Halysites*, spines set in a lamellar sclerenchyme. There are longitudinal furrows on the epitheca, as in the Rugosa, however, and Weissermel has stated that the genus may be close to the Rugose *Tryplasma* (a member of the Rhabdocyclidae). I am unable to accept the opinion of Lang, Smith and Thomas (1940, p. 112) that *Pycnostylus* is a synonym of *Fletcheria*, as the former appears to me to have lamellar septa. Weissermel also regards his "*Lyopora*" *amplexoides* from the high Upper Silurian of Antirovitha as a tabulate coral. It has similar general characters to those he described for *Fletcheria*, but has lateral increase in contrast to the calicinal increase of *Fletcheria*. There seems to be no generic identity between this species and the genotype *Lyopora favosa* Nicholson and Etheridge from the Craighead Limestone of Girvan, which possibly is related to *Calapoecia* Billings.

Genus Pycnostylus Whiteaves. Plate xi, fig. 1.

Pycnostylus Whiteaves, 1884, p. 2.—? *Cyathopaedium* Schlüter, 1889, p. 5, genotype *Calophyllum paucitabulatum* Schlüter, 1881, p. 190, Pl. ii, figs. 1–4; Stringocephalus beds (Givetian), Germany.—? *Cylindrophyllum* Yabe and Hayasaka, 1915, p. 90, genotype *Cylindrophyllum simplex* Yabe and Hayasaka, *id.*, 1920, Pl. vi, figs. 3*a*, *b*; Devonian, Yun-nan. (Non *Cylindrophyllum* Simpson, 1900, p. 217.)

Genotype, *Pycnostylus guelphensis* Whiteaves, 1884, p. 3, Pl. i, figs. 1–1*b*, Guelph (? Lower Ludlow), Hespeler, Guelph, Ontario. See also Lambe, 1901, p. 132, Plate x, figs. 4, 4*a*.

Diagnosis.—Phaceloid Rugose corals with axial increase, typically quadripartite, with thin walls, short lamellar septa and complete flat tabulae.

Remarks.—The diagnosis brings out a difference between the Australian corals placed herein, and those placed in *Tryplasma*. In *Tryplasma* the septa are acanthine, but in *Pycnostylus* they are lamellar. I have examined (by courtesy of Dr. A. E. Wilson) a topotype of *P. guelphensis*, and although it is dolomitized, I consider that it has short, lamellar septa as in amplexiморphs, and not short, rhabdacanthine septa as in *Tryplasma*. The Australian species have true amplexoid septa, i.e. very low prolongations from the peripheral lamellar portion continue along the upper surfaces of the tabulae towards the axis; such prolongations have not been observed in the topotype of *P. guelphensis*, but they may have been obscured by the dolomitization. Possibly the "extremely short spines" mentioned by Etheridge in the Australian specimens are to be explained as sections showing this discontinuity in the axial edges of the septa, rather than as sections of the rhabdacanths or holacanths of the Rhabdocyclidae. I have seen no evidence of such free trabeculae in either of the Australian species placed in the genus herein. Weissermel (1939, p. 14) has described the structure of the wall and septa in *Cyathopaedium*, and the similarity in these characters in the two genera indicates that they are synonymous.

The range of *Pycnostylus* is ? Lower Ludlow of Canada and Silurian of New South Wales, and, if *Cyathopaedium* be a synonym, extends into the Givetian of Germany.

Pycnostylus congregationis (Etheridge). Pl. xi, figs. 2*a*, *b*.

Tryplasma congregationis Etheridge, 1907, p. 84, Pl. xiii, fig. 1, Pl. xxi, fig. 10, Pl. xxiii, fig. 10; Silurian, Derrengullen Ck., Bowning district, New South Wales.

Lectotype (here chosen), F 8879, Australian Museum, figured Etheridge, 1907, Pl. xiii, fig. 1.

Diagnosis.—Phaceloid *Pycnostylus* with corallites 10 to 15 mm. in diameter, with numerous connecting processes arranged in tiers.

Description.—The corallum is very large, the corallites cylindrical or oval, 10 to 15 mm. in diameter, and unequally spaced. They show frequent growth constrictions and swellings. Connecting processes are numerous, at the same level in neighbouring corallites and more or less equally spaced at about 10 mm. apart. The epitheca shows fine growth annulation, but no or only very faintly marked longitudinal striation. Increase is probably peripheral, two offsets having been observed replacing one. There are 34 to 36 thin septa, lamellar and amplexoid, not acanthine. Straight axial prolongations extend over the upper surfaces of the tabulae almost to the axis, as very faintly marked ridges, but below the tabulae the septa are very short, less than 1 mm. The minor septa

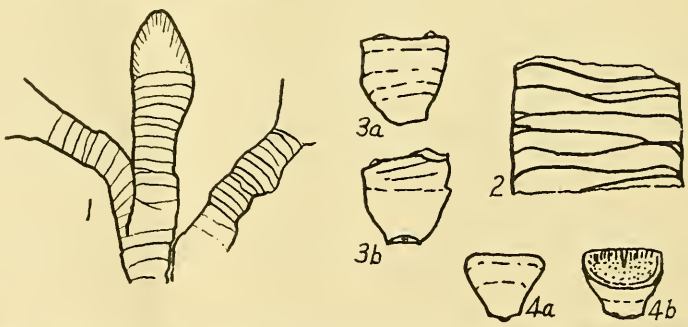
do not extend over the tabulae, and are less than 1 mm. in length. The tabulae are complete, with very slightly downturned edges.

Remarks.—The corallites of this species have a much greater diameter than in the genotype, but are approximately the same size as those of *P. dendroides*, which occurs with it, and which may indeed be but a forma of *congregationis*. Diagnostic structural differences between stems of *Mycophyllum liliiforme* and detached fragments of corallites of *P. congregationis* and *P. dendroides* have not been noted, and it might be that *P. congregationis* is really only an aggregation of stems of *M. liliiforme*, but they do not appear to be widely enough spaced to allow development of the calices of *M. liliiforme*, and the occurrence of offsets suggests they are not mere stems.

Localities.—In addition to the type locality, the species occurs at Hatton's Corner in the Barrandella shales.

Pycnostylus dendroides (Etheridge). Text-figs. 1, 2.

Tryplasma dendroidea Etheridge, 1907, p. 87, Pl. xiv, fig. 1; Pl. xv, fig. 5; Pl. xviii, figs. 2–6; Pl. xix, fig. 6; Pl. xxii, figs. 11–15; Pl. xxiii, fig. 9; Pl. xxiv, fig. 6; Pl. xxvii, figs. 3, 4; Silurian, Derrengullen Ck., Bowning district, New South Wales.—Non *Tryplasma dendroidea* Etheridge, Hill, 1937, p. 151, text-fig. 9, grey limestone of Curradulla or Limestone Ck., New South Wales, which is *Tryplasma* sp. cf. *lonsdalei* Etheridge.



Text-fig. 1.—*Pycnostylus dendroides* (Etheridge). Outline drawing of exposed surface of lectotype, F 8895, Australian Museum Collection; Silurian, Barber's Ck., off Derrengullen Ck., near Bowning. × ¾.

Text-fig. 2.—*Pycnostylus dendroides* (Etheridge). Drawing of vertical section figured by Etheridge, 1907, Pl. xxiv, fig. 6. × 1½.

Text-fig. 3.—*Rhizophyllum interpunctatum* de Koninck. Outline drawings from Etheridge's figures (1881, fig. 7) of a syntype, now missing, of his *Rhizophyllum australe*. Silurian, near Yass. × ¾. 3*a*, flat face; 3*b*, semicircular face.

Text-fig. 4.—*Rhizophyllum interpunctatum* de Koninck. Outline drawings from Etheridge's figures (1881, fig. 8) of a syntype, R 33579, British Museum (Natural History) Collection, of his *Rhizophyllum australe*. Silurian, near Yass. × ¾.

Lectotype (here chosen), F 8895, Australian Museum, figured Etheridge, 1907, Pl. xv, fig. 5. Silurian, Barber's Ck. (a branch of Derrengullen Ck.).

Diagnosis.—Dendroid *Pycnostylus* with quadripartite axial increase, the offsets diverging, the corallites being 12 mm. in average diameter.

Description.—The corallum is dendroid, the corallites being 12 mm. in average diameter, expanding to 15 or 20 mm. just before increase, which is usually quadripartite and axial. The offsets diverge. The epitheca shows fine growth

annulation. Connecting processes occur rarely. The septa are about 55, the minor being indistinguishable from the major in section, where all are about 1 mm. long. They are lamellar, not acanthine, and are amplexoid, as in *P. congregationis*. The tabulae are complete, with slightly downturned edges, rather distant.

Remarks.—As Etheridge has already remarked, the species closely resembles *P. congregationis* in size of corallite and nature of septa and tabulae, but differs in the growth form, being dendroid instead of phaceloid, and in the number of septa, Etheridge having observed nearly twice as many septa in *P. dendroides* as in *P. congregationis*. It seems to me probable that the two are simply growth forms of one species, and that the smaller number of septa counted by Etheridge in *P. congregationis* was due to his having used only a small corallite of this species, as I have counted 54 septa in a corallite of 12 mm. diameter in *P. congregationis*. But this must await confirmation by field studies.

The possibility that the corallites of *P. dendroides* are merely the stems of *Mycophyllum liliiforme*, which is suggested by general structure, is discounted by the arising of four new corallites from an old one, by axial increase. It is thought unlikely, but not perhaps impossible, that mere stems would show such increase.

The specimen in the Sedgwick Museum, from the W. B. Clarke Collection, which I called *T. dendroidea* (Hill, 1937, p. 151, text-fig. 9) now appears to me to be a true *Tryplasma*, as it has the rhabdacanthine septa of that genus, whereas the type of *P. dendroides*, which I have since examined, has amplexoid, lamellar septa. The Sedgwick Museum specimen has stouter corallites than is usual in *T. lonsdalei*, but it is here transferred doubtfully to that species.

Localities.—In addition to the type occurrence, the species is found in the Silurian Barrandella shales of Hatton's Corner, Yass R., N.S.W.

Family Calceolidae.

Typical genus, *Calceola* Lamarck, 1799, p. 89.

Calceoloid Rugosa with a semi-circular operculum.

Range.—Wenlock and Ludlow of Europe, Asia, North America and Australia, Lower Devonian of France, and Middle Devonian of Europe, Asia and Australia.

Remarks.—Lindström (1883, p. 9), the founder of the family, placed in it the Middle Devonian *Calceola*, the Chinese Wenlock and Russian Gedinnian and Eifelian *Platyphyllum* Lindström (1883, p. 40), the widespread Wenlock to Lower Devonian *Rhizophyllum*, and the English and Scandinavian Wenlock and Ludlow *Goniophyllum* Edwards and Haime (1850, p. lxix), the first three forming one sub-group, and the last a second sub-group. In the diagnosis given above, *Goniophyllum* is excluded from the family, as it differs not only in being prismatic instead of semi-circular in section, and in having four opercula instead of one, but also in septal structure; the septa of *Goniophyllum*, being dilated lamellar, suggest relationship to the Pycnactidae rather than to *Rhizophyllum*, which has semi-acanthine septa. It is possible that *Calceola* was derived from *Rhizophyllum* through *Platyphyllum* by the gradual thickening of the skeletal elements, though the structure of the septa in *Platyphyllum* has never been clearly figured. *Calceola glossophylloides* Sochkina (1936, p. 69), from the Eifelian of the Northern Urals, may be *Platyphyllum*, as the figures show dilated, arched plates.

Lindström united his family Calceolidae with another, the Araeopomatidae, also with opercula, into the Anthozoa operculata; but all of these corals have the septal arrangement of the Rugosa, so that they are Anthozoa rugosa; an operculum

may have been evolved in many lineages, and Lindström's Operculata is most probably polyphyletic. Lindström remarked on the possible homology of the opercula with the epithecal scales found in *Tryplasma*, and Smyth (1933) has recently described epithecal scales in Carboniferous Tabulata. The arrangement of the internal plates in *Rhizophyllum* and *Platyphyllum* and the semi-acanthine nature of the septa in *Rhizophyllum* suggest comparison with *Cystiphyllum*.

Genus Rhizophyllum Lindström.

Rhizophyllum Lindström, 1866*a*, p. 279; 1866*b*, p. 411; 1883, p. 22.

Genotype (by designation, Lindström, 1866, p. 411), *Calceola gotlandica* F. Roemer, Silurian, Gotland.

Diagnosis.—Calceoloid corals with semi-circular operculum; with undilated, arched horizontal skeletal elements, none of which extend completely across the lumen, and with vertical skeletal elements reduced to a series of short septa, partly lamellar and partly acanthine, on the flattened side of the corallum.

Range.—Gotlandian of Gotland and England, Asia, North America and Australia, and Lower Devonian of France.

Remarks.—Two Ludlovian species, *R. elongatum* Lindström from Gotland, and *R. attenuatum* Lyon from North America, are compound, the former by calicinal increase, the latter by stolonal increase. *R. tenesseense* F. Roemer is without rootlets, but all other described species have them.

Rhizophyllum interpunctatum de Koninck. Pl. xi, figs. 4–10; text-figs. 3, 4.

Rhyzophyllum interpunctatum de Koninck, 1876, p. 61, Pl. i, fig. 14; Silurian, Rock Flat Ck., Manero, N.S.W.—*Rhyzophyllum? interpunctatum*, *loc. cit.* Explanation to plates.—*Rhizophyllum australe* Etheridge, 1881, p. 248, figs. 7, 8; Silurian, Yass, N.S.W. A type for this cannot at present be chosen. See under remarks.—*R. australe* Etheridge, 1891, p. 202 *pars*, i.e. Pl. xxx, figs. 4–6; Silurian, Hatton's Corner, Yass R., N.S.W.—*R. interpunctatum*, Etheridge, 1891, p. 203, Pl. xxx, figs. 7–15; Silurian, Hatton's Corner, Yass R., N.S.W., and Silverdale, near Bowning.—*R. australe*, Shearsby, 1906, p. 549, Pl. xxvi, figs. 8, 23, 24; Silurian, Hatton's Corner, Yass R.—*R. interpunctatum*, Shearsby, *id.*, figs. 9–18, 20–22; Silurian, Hatton's Corner, Yass R.

Type Material.—De Koninck's specimens were lost in the Garden Palace Fire at Sydney, 1882. The type locality has not been revisited, and no topotypes are available, so that it is not possible to choose a neotype. From de Koninck's figure it seems reasonably certain that the specimens from Yass described below are conspecific with the Rock Flat specimen, and the following diagnosis and description are based on them.

Diagnosis.—*Rhizophyllum* attaining a diameter of 10–15 mm. in a height of from 10 to 20 mm., and thereafter a fairly constant diameter, with or without rejuvenescence.

Description.—The calceoloid corallum is usually curved, so that the flat surface is longer than the semi-circular surface. When the curvature is great, the calical margin (which during growth appears to have remained approximately parallel to the sea-floor) is oblique to the flat surface; when curvature is small the calical margin is approximately at right angles to the flat surface. The average maximum diameter is 15 mm.; when this is attained the corallum ceases to grow in width as it grows in height, or rejuvenescence may occur. The proximal expanding portion of a corallum is turbinate or trochoid. The epitheca shows growth annulation, and sometimes a longitudinal ridge in the middle of

the flat face, less frequently in the middle of the semi-circular face also. The junction of the flat and semi-circular faces may be at a sharp or rounded angle. The calice has its deepest part near the middle of the semi-circular face, the curvature of its floor increasing very rapidly into this pit. Septa are usually visible along the flat edge, the counter septum being large, and extending half-way to the eccentric axis (the calicular pit); they are in two series, the minor being 1 or 2 mm. long, while the major septa increase in length from the angles towards the counter septum. In moulds of the calice the furrows left by the septa and the intervening ridges bear minute granules, and these continue down into the calicular pit after the septal furrows have died away. Rootlets arise from the lateral angles, and some few from the proximal parts of the flat face. The operculum is semi-circular, with a notched median ridge on its lower surface at the flat edge, and bears ridges and furrows spreading out to the semi-circular edge from the flat edge, being most marked at the flat edge. It consists of dense sclerenchyme.

In thin section, the corallum is seen to consist of small domed plates, those between major and minor septa at the flat surface being smaller and more horizontally based than the others, which are inclined parallel to the floor of the calice. Dilatation of the domed plates may occur periodically on the floors representing previous positions of the calice. Septa are seen at the flat surface as short, sometimes thickened plates, sometimes represented by discrete trabeculae.

Remarks.—Etheridge (1881) founded the species *R. australe* on three syntypes collected by Liversidge from Yass. One syntype, that figured fig. 7, is missing; that figured fig. 8 is R33579 in the British Museum (Natural History), London; the third, unfigured, is 90285 in the British Museum. Since lectotypes must be chosen from syntypes, if available, one of these three must be used for the interpretation of *R. australe*. R33579 is not desirable, since Etheridge removed it from the species (1891) into *interpunctatum* de Koninck; 90285 is not at present available, so that one cannot be sure of its characters; the third is missing. Consequently no lectotype can be chosen herein. Etheridge in 1891 considered that two species could be recognized amongst the smaller *Rhizophyllum* of Yass, one, *R. interpunctatum*, in which the corallum was broader, and less erect, and had more noticeable septa than the other, to which he restricted his name *R. australe*, although his description and figures in 1881 both referred to the broader coralla. I have examined many individuals from Yass, however, and have found all variations in size between the two limits mentioned in my diagnosis; variation in the periodic dilatation of old calical floors is great; variation in the strength of the septa also occurs, and I have not found that strong septa are always more noticeable in the broader coralla, nor that the broader coralla are always the more curved. All the specimens I have seen I regard as one species, *R. interpunctatum*. Nevertheless I have not seen any specimen with quite such elongate proportions as $7\frac{1}{2} \times 22\frac{1}{2}$ mm., as figured by Etheridge, 1891, figs. 1–3, and it might be that this specimen is a species distinct from all the others. On the other hand, it may only represent the limit of variation of the Yass species, which appears most reasonably referable to *R. interpunctatum* de Koninck.

The species is smaller than *R. gotlandicum* (Roemer), from the Gotlandian of Europe, but is otherwise very similar to it.

Localities.—In addition to the localities mentioned in the synonymy, the species occurs in a bed of impure limestone in Derrengullen Ck., a few hundred yards above the Yass-Wargeila road crossing.

RHIZOPHYLLUM ROBUSTUM Shearsby. Plate xi, figs. 11*a*, *b*.

Rhizophyllum robustum Shearsby, 1906, p. 548, Pl. xxvi, figs. 1–6, 19; impure limestone on the Wargeila road about ½ mile west of Yass Junction railway station; impure coral limestone, Derrengullen Ck., a few hundred yards above the Yass-Wargeila road crossing. Silurian.

Lectotype (here chosen), F 37056, Australian Museum, figd. Shearsby, *loc. cit.*, figs. 1–6; impure limestone on the Wargeila road about ½ mile west of Yass Junction railway station. Silurian.

Diagnosis.—Large turbinate, erect *Rhizophyllum* with calice about 29 × 16 mm., at a height of about 29 mm.

Description.—The corallum is turbinate and erect, and may have a distal portion which grows in height, without increase in diameter; the calice is 38 × 20 mm. in a large specimen from Limestone Ck. The calical margin is at right angles to the ventral face (as is usual in calceolids when the corallum is erect). The characters of the calice, the epitheca, and the internal structure including the position of the calicular pit, are as described above for *R. interpunctatum*. Hollow cylindrical rootlets may occur on the flat face and at the lateral angles.

Remarks.—This species closely resembles *R. gotlandicum* (Roemer) from the Wenlock and Ludlow of Gotland, and may indeed be a synonym. It differs from *R. interpunctatum*, with which it occurs, only in size and in being erect; but specimens forming a gradational series in size between the two have not been found.

Localities.—In addition to the localities mentioned in the reference, the species occurs at Limestone Ck., a tributary of Derrengullen Ck., in the Silurian.

RHIZOPHYLLUM YASSENSE Shearsby. Plate xi, figs. 12*a*, *b*.

Rhizophyllum yassense Shearsby, 1905, p. 869, Pl. xxvi (xxvii); Silurian. Shales in Derrengullen Ck. at the junction with Limestone Creek, near Bowning, N.S.W.—*R. yassense*, Shearsby, 1906, p. 549, Pl. xxvi, fig. 7.

Monotype, Australian Museum, F 37055, figured Shearsby, *loc. cit.*

Diagnosis.—Widely expanded *Rhizophyllum* of sub-oval section, erect at first, and curved distally, with calicular pit sub-central.

Remarks.—Only the holotype is known. It is 20 mm. tall, and the calice is 42 mm. × 20 mm. The flat surface is pinched in near the calice, so that the calical margin is a crescentic oval. The position of the calicular pit, sub-central instead of just inside the middle of the semi-circular face, is unusual. The other species from Yass all have this calicular pit in the normal position. The septa are but faintly distinguishable, but the lumen is filled with the small domed plates typical of the genus. A few bases of rootlets are visible on the flat face near the lateral angles. It may be that this specimen is a malformed individual of *R. robustum*, as no other specimens have been found with the crescentic calice and excentric pit.

CYSTIMORPHS.

Cystimorphs, Hill, 1939*b*, p. 248.

Genus CYSTIPHYLLUM Lonsdale.

Cystiphyllum Lonsdale, 1839, p. 691, see Lang and Smith, 1927, p. 455.

Genotype, *Cystiphyllum siluriense* Lonsdale, 1839, p. 691, Pl. xvi, figs. 1, 1*a*, *non* fig. 2; Wenlock Limestone, Wenlock and Dudley.

Diagnosis.—Rugose corals in which the vertical skeletal elements are represented entirely by holacanths and the corallum is constructed almost entirely of arched horizontal skeletal elements, none of which extend completely across the lumen.

Range.—Silurian of Europe, N. America and Australia.

Cystiphyllum sp. cf. bohemicum Počta. Plate xi, figs. 13*a*, *b*.

Material.—F 3554–7 University of Queensland Collection, Bowspring Limestone, Hatton's Corner, Yass R., N.S.W. Silurian.

Diagnosis of Yass specimens.—Large trocho-cylindrical *Cystiphyllum* with a wide tabularium of large and frequently complete tabulae.

Description.—The largest specimen, which is unevenly weathered, is 9 cm. long and 3·5 cm. in diameter, but as most of the dissepimentarium is weathered away, the actual diameter must have been considerably greater. All of the specimens have been worn before fossilization, and in some only the tabularium remains. No septal spines are visible in the only transverse section obtained. The dissepiments are moderately large and are steeply inclined, and the unweathered dissepimentarium was at least 12 mm. wide. The tabularium is 20 mm. or more in diameter, and the tabulae are large, arranged in concave floors, some being complete, but many being represented by several tabellae, which are rather globose.

Remarks.—These large incomplete specimens resemble *Cystiphyllum siluriense* from the Wenlock Limestone of Wenlock (Lang and Smith, 1927, p. 476) and *C. bohemicum* Počta (1902, p. 164) from E_2 (Lower Ludlow) of Tachlowitz very closely. They appear closer to *C. bohemicum* because of the great coarseness of their tabular tissue. More specimens are required for an accurate specific evaluation.

Genus Holmophyllum Wedekind.

Holmophyllum Wedekind, 1927, p. 30.—*Hedstromophyllum* Wedekind, 1927, p. 64, genotype *Hedstromophyllum articulatum* Wedekind, 1927, p. 65, Pl. 21, figs. 1, 2, Pl. 26, figs. 6–12; Gotland, Horizon III (Lower Ludlow).

Genotype (by monotypy), *Holmophyllum holmi* Wedekind, 1927, p. 31, Pl. 4, figs. 6–8, Pl. 29, fig. 16; Lau beds (Lower Ludlow), Gotland.

Diagnosis.—Cystimorphs in which the discontinuous acanthine trabeculae each pierce several dissepiments or tabulae.

Remarks.—The morphology of *Hedstromophyllum* seems to be identical with that of *Holmophyllum*, although Wedekind considered the former a descendant of *Cystiphyllum*, and the latter a descendant of *Tryplasma*. *Holmophyllum*, however, does not show the double septal ridges on the epitheca so characteristic of *Tryplasma* and, like *Cystiphyllum*, it has a dissepimentarium, which is lacking in *Tryplasma*. In addition to the Ludlow forms mentioned by Wedekind and by Alexander (1936, p. 107), and the Salopian species described by Lewis (1934, p. 96), I have seen a species from the Woolhope Limestone of Woolhope. The range of the genus would thus appear to be Middle and Upper Silurian.

Holmophyllum multiseptatum, n. sp. Plate xi, figs. 14*a*, *b*.

Holotype, F 1023, University of Queensland Collection, said to be from Cliftonwood, near Yass. This is the only specimen known.

Diagnosis.—Trochoid *Holmophyllum* with very numerous septa.

Description.—The corallum is trochoid, expanding to a diameter of 35 mm. in a height of 55 mm., somewhat flattened, and nearly erect. Growth expansions and contractions are frequent. There are about 180 septa represented by single radial series of discrete trabeculae. The septa appear to be divisible into major and minor septa, but so close are the radial series of trabeculae that it is difficult to be certain of this. The trabeculae of a series are frequently connected by dissepiment-like plates. The arrangement of fibres in the trabeculae cannot be ascertained, but some of the trabeculae are elongated across the length of the septum. The longer septa reach almost to the axis, and the shorter extend half-way or less than half-way. The dissepiments are close, rather small elongate plates, lying approximately horizontally near the periphery, but descending steeply towards the tabularium. The tabularium is about 8 mm. wide at a diameter of 35 mm. The tabular floors are concave and the tabellae are small, closely packed and rather elongate. In vertical section the trabeculae can be seen piercing the dissepimental tissue, running at right angles to the course of the dissepiments.

Remarks.—This species is much larger than any of the described European species of the genus, and the septa appear to be more numerous. The age indicated would be within the range of the genus, Wenlock or Ludlovian.

Family Disphyllidae (Hill, 1939*a*, p. 224).

Genus Disphyllum de Fromentel.

Disphyllum de Fromentel, 1861, p. 302; Lang and Smith, 1935, p. 544; Hill, 1939*a*, p. 224.

Genolectotype (chosen Lang and Smith, 1934, p. 80), *Cyathophyllum caespitosum* Goldfuss, 1826, Pl. xix, fig. 2*b*. Middle Devonian, Eifel; renamed *Cyathophyllum goldfussi* Geinitz, 1846, p. 569. See Lang and Smith, 1935, p. 568.

Diagnosis.—Phaceloid Rugose corals in which increase may be lateral or peripheral; the septa rarely reach the axis, but are usually long, and typically thin; the tabulae are sometimes complete, though generally incomplete and differentiated into a transverse axial, and an inclined periaxial series; with dissepiments typically small, strongly arched, sometimes of one, but frequently of two, kinds: an inner, single series of globose, distally directed dissepiments, and an outer series of flat or arched dissepiments.

Remarks.—In Europe and North America the genus is characteristic of the Middle and Upper Devonian. In Australia it occurs in the Silurian (Wenlock or Ludlow), Lower and Middle Devonian.

Disphyllum praecox, n. sp. Plate xi, figs. 15–17.

Holotype, Australian Museum F 9709, with two thin sections A.M. 745. Shale in Limestone Creek, 50 yards below the Bowning–Wargeila road crossing. Silurian.

Diagnosis.—*Disphyllum* with major septa somewhat withdrawn from the axis, and minor septa half as long; with complete, slightly domed tabulae, and rhomboid or very globose dissepiments.

Description.—The corallum is sub-phaceloid or almost spreading, increase being peripheral, usually four new corallites appearing at once, killing the parent. Connecting processes occur, and when the corallites are in contact they may be partly cerioid. The average adult diameter is 15 mm., but it may be larger just before increase. There are 20 to 22 septa of each order, the major septa extending from one-half to two-thirds of the distance to the axis, so that an axial space is left. The minor septa are only half as long as the major septa. Both orders are attenuate, and rather wavy, sometimes with extremely short carinae. The tabulae

are complete and very slightly domed, or sometimes saucered, rather evenly spaced, about 10 in 5 mm. Usually only one series of dissepiments is present, consisting of plates which are flattened at the periphery, extend inwards for a greater distance than their height, and then curve down with a swollen curve to meet the plate below, so that in vertical section they look like a series of rhombs. When more than one series of dissepiments are developed, they are very globose, almost horseshoe-shaped.

Remarks.—This, the only known Silurian species, is closest to *D. gemmiforme* Etheridge from the Devonian of the Yass district, but the latter differs in having the major septa as short as the minor septa and a more spreading growth. Two species from the Lower Middle Devonian Nevada limestone, *Spongophyllum nevadense* Stumm (1937, Pl. 55, fig. 5) and *Spongophyllum expansum* Stumm (*id.*, fig. 6) somewhat resemble these Australian Disphyllids, but the minor septa are discontinuous. They may also be *Disphyllum*.

Localities.—This species occurs in the Silurian of the Yass district at the following places in addition to the type locality: Por. 35, Par. Derrengullen. On the south bank of the Yass R. in Por 84, Parish of Waroo (Station 61), F 8633, A.M. 624, Australian Museum Collection. Bowspring Limestone, Yass, S 9, F 179, O. A. Jones Collection, University of Queensland. Por. 161, Parish of Yass (Station 108, Yass R.), F 9719, A.M. 744, Australian Museum Collection. Limestone Ck., Bowning district, F 9879, Australian Museum Collection.

There are also specimens which may belong to this species in the University of Queensland Collection from Parkes road, Wellington, N.S.W., collected by O. A. Jones and A. K. Denmead.

Family Mycophyllidae, Hill, 1940, p. 156, *q.v.*

Genus Mycophyllum Etheridge.

? *Aspasmophyllum* F. Romer, 1880, p. 184. Monotype, *Aspasmophyllum crinophilum* Romer, *id.* [Middle] Devonian, [possibly crinoid beds at base of Givetian, Gerolstein], the Eifel.—*Mucophyllum* Etheridge, 1894, p. 11.—Lang, Smith and Thomas, 1940, p. 87, have corrected the spelling to *Mycophyllum*.

Genotype (by monotypy), *Mucophyllum crateroides* Etheridge, *id.*, Pls. iii, iv. Silurian, [Hatton's Corner, Yass R.], N.S.W.

Diagnosis.—Simple or sub-compound Rugose corals with expanded calical rims; with the approximately equal major and minor septa dilated and in contact so that dissepiments are entirely suppressed, and with complete and distant tabulae.

Remarks.—The genus is here understood to include those Mycophyllidae with expanded calical rims. I place in it, besides the genotype, *Tryplasma liliiforme* Etheridge, described below, which has a narrower stem-like portion below the calice, and is sub-compound, *Pseudomphyma atava* var. *expansa* Wedekind (1927, p. 38, Pl. vii, figs. 4, 5) and *Pseudomphyma turbinata* Wedekind (*id.*, Pl. viii, fig. 7, Pl. vi, figs. 1, 2), solitary forms with broad stems from the Ludlovian of Gotland, *Pseudomphyma expansa* Wedekind, Sochkina (1937, p. 56) from the Middle Ludlow of the Urals, another solitary form, and *Amplexus* (*Coelophyllum*) *eurycalyx* Weissermel (1894, p. 634) from the diluvial of Germany, a sub-compound species. Another form with an expanded calical rim is *Aspasmophyllum crinophilum* from the Middle Devonian of Germany; but it is insufficiently figured, and one cannot be sure that *Mycophyllum* is synonymous with it, although this seems likely.

Septal Structure.—In his description of *Mycophyllum*, Etheridge mistakenly considered the lines of junction of the dilated septa to be attenuate septa, and thus failed to recognize the similarity between *M. liliiforme* and *M. crateroides*. As in

the other Mycophyllidae, the dilated septa consist of rhabdacanths, in which the 'rods' diverge from the axis in a very broad curve, directed on the average at about 30° from the axis. The rods are fairly widely spaced, and all are set in a lamellar sclerenchyme which is parallel to the distal surfaces of the septa, and is not continuous from one septum to the next. The rhabdacanths are about 1 mm. apart. In the expanded calical rim the rhabdacanths are directed at right angles to the upper and lower surfaces of the rim. The septal structure has been well illustrated by Lang (1926, p. 431, Pl. xxx, figs. 7, 8).

MYCOPHYLLUM CRATEROIDES Etheridge. Plate xii, figs. 1, 2.

Mucophyllum crateroides, Etheridge, 1894, p. 18, Pls. iii, iv; Hatton's Corner, Yass R.; Old Limekiln Ridge, Humewood, near Yass; Quedong, Delegate R., Co. Wellesley, N.S.W. Silurian.—Lang, 1926, p. 433, Pl. xxx, figs. 7, 8.

Lectotype (here chosen), F 3048, Australian Museum Collection, figured Etheridge, *loc. cit.*, Pl. iv, fig. 3, Humewood.

Diagnosis.—Solitary, patellate *Mycophyllum* with broad, thick, slightly everted, expanded calical rim, and short, conical stem.

Description.—The corallum is solitary, attached and large, patellate, with expanded calical rim which is broad, thick and slightly everted. It may be 115 mm. in diameter and 80 mm. tall, but the average size is rather less. In a corallum 80 mm. in diameter, the calical rim was 30 mm. wide, and 11 mm. thick in its thickest part, which was midway between the periphery and the axial calicular pit corresponding to the tabularium. The edge of the calical rim is scalloped, the undulations occurring at the junctions of the septa. Rootlets may occur irregularly on the under surface. The axial calicular pit may be about 15 mm. wide. The cardinal fossula is a deeper indentation at the edge of the calicular pit.

There are 75 to 80 septa, the major not being distinguishable from the minor, dilated, and in contact throughout their length. The junction line of two septa is irregular, showing in section as a thin, very wavy line. In the proximal cone they are extremely short, but they form the entire expanded calicular rim. The septa consist of rhabdacanths set in lamellar sclerenchyme, the dimensions and arrangement being as remarked under the genus. The tabularium is the short, broadly conical "stem" below the expanded calice, and the tabulae are complete, flat and rather distant, and may be much dilated. They are sometimes dilated, and in a thin transverse section (Australian Museum 796) taken through the thickening on a tabula, shadows indicate that the thickening is septal in origin, the septa being excessively dilated and in contact. It appears further that the major septa were long and extended approximately to the axis. This length of the septa only in the thickening above the tabulae shows that the septa are amplexoid, i.e., perfectly developed only on the upper surfaces of the tabulae, and then between tabulae are withdrawn towards the periphery. The rootlets are thick-walled and hollow or crossed by transverse partitions.

Remarks.—Of the foreign representatives of the genus, specimen A 6269 in the Sedgwick Museum, Cambridge, from the Slite-gruppen, Gotland, is the closest to *M. crateroides*. It has a wider fossula and a thicker rim, but these are the only observable differences. This Upper Wenlock specimen may be *Pseudomphyma patellata* Wedekind (1927, p. 38), which is unfigured, from horizon IVb of Hedström (Ludlow).

Localities.—I have seen specimens from the Silurian of Hatton's Corner, Yass R.; Humewood, near Yass; and from Spring Ck., near Mt. Canoblas, N.S.W.

MYCOPHYLLUM LILIIFORME (Etheridge). Plate xi, figs. 18, 19; Plate xii, figs. 3–6.

Tryplasma liliiformis Etheridge, 1907, p. 95, Pl. xiv, figs. 2, 3; Pl. xv, figs. 2, 3 (*non* fig. 4); Pl. xvii, figs. 7, 8; Pl. xxiv, fig. 1; Pl. xxv, fig. 8; Pl. xxvii, figs. 1, 2; from Barber's Ck. and Derrengullen Ck.; Hatton's Corner, Yass R.; East bank, Yass R., Por. 103, Par. Waroo (NE corner); Por. 106, Par. Barton, Co. Ashburnham, near Mt. Canoblas. Silurian.

Lectotype (here chosen), F 8892, Australian Museum, Silurian, Barber's Ck., off Derrengullen Ck., Bowning district. Figured Etheridge, *loc. cit.*, Pl. xv, fig. 3.

Diagnosis.—Subcompound *Mycophyllum* with turbinate or trochoid stem, and thin, spreading calical rim; with occasional peripheral increase.

Description.—The corallum may be sub-compound, some offsets arising from the calicular rim. The corallite is liliaciform, with a turbinate or trochoid stem (the tabularium) below, and an expanding, bell-shaped calical rim. The rim is never everted, though the curvature from the stem usually increases upwards and outwards. The rim remains thin, from 1 to 2 mm.; it may be 25 mm. wide, in a calice 60 mm. in diameter. Sections are sometimes observed indicating that a broadly curved operculum may be present over the top of the calice, of the same thickness as the calicular rim. Rootlets are sometimes on the stem.

There are about 80 dilated septa in a large calice, the major being just distinguishable from the minor. Each septum may be from 1 to 1·5 mm. wide at the edge of the calice. They are very short in the stem between the tabulae and in the calice they are so dilated that the bell walls consist entirely of them. They are rhabdacanthine, the ends of the rhabdacanths projecting a little as spines at the inner edges, particularly near the calicular pit. The tabularium may be 20 mm. wide at the base of the calice, and the stem-like portion extends downwards, sometimes with rapidly decreasing diameter, sometimes slowly decreasing, the longest incomplete stem observed being 20 mm. at the top and 12 mm. at the broken base. The tabulae are complete, horizontal and rather distant, or incomplete and rather irregular.

Localities.—Those given in the reference above.

Remarks.—Etheridge considered this form a *Tryplasma* because of the spines usually present at the inner edges of the septa. The species may indeed be distantly related to *Tryplasma*, but its morphology is that of the Mycophyllidae, and it is very close to *Mycophyllum crateroides*. Etheridge missed the resemblance because he considered the wavy lines of junction between the dilated septa of *crateroides* to be true, attenuate septa. *M. liliiforme* is, as Etheridge pointed out, very similar to *Amplexus eurycalyx* Weissermel from the diluvial of Germany. It is also somewhat similar to species from the Ludlovian of Gotland placed in *Pseudomphyma* Wedekind (1927, p. 38). It is possible, see above, p. 393, that "*Tryplasma dendroides* Etheridge" and "*Tryplasma congregationis* Etheridge" may be the stems of *M. liliiforme*.

Family PYCNACTIDAE.

Typical genus, *Pycnactis* Ryder, 1926.

Solitary Rugose corals in which the septa are dilated in the tabularium, and thin in the dissepimentarium, when this is developed; with incomplete tabulae, usually inclined downwards to an excentric axis; dissepiments when present are typically small and neither flattened nor globose.

Range.—Silurian of Europe and New South Wales.

Remarks.—The family is important in the Silurian of Britain and the northern European countries, and is represented also in New South Wales. The British

members are all to be referred to the genera *Pycnactis* Ryder (1926, genotype *Hippurites mitratus* Schlotheim), *Mesactis* Ryder (1926, genotype *Mesactis glevensis* Ryder), *Phaulactis* Ryder (1926, genotype *Phaulactis cyathophylloides* Ryder from the Slite Gruppen of Westergarn, Gotland) and *Lamprophyllum* Wedekind (1927, pp. 76, 78, genotype *L. de-geeri* Wedekind, 1927, p. 78, Pl. xxviii, figs. 1–4, from the Silurian marls of Petesvik, Gotland). Probably *Mesactis* is superfluous. It was intended for individuals whose neanic stages were intermediate between those of *Pycnactis mitratus* and *Phaulactis* in the development of the horizontal skeletal elements, but the holotype of *P. mitratus* has some dissepiments already developed (*fide* Smith) and forms with only a few dissepiments can thus be placed in *Pycnactis*; other individuals with more dissepiments may be regarded as *Phaulactis*.

Scandinavian forms have recently been studied by Wedekind (1927) and Vollbrecht (1928), and from their figures it seems to me that the following belong to the Pycnactidae. Their genotypes are given in the Index, of Lang, Smith and Thomas. (1) *Lycophyllum* Wedekind (1927, p. 68); (2) *Lycocystiphyllum* Wedekind (1927, p. 73); (3) *Aulacophyllum* of Wedekind (1927, p. 74), *non* Edwards and Haime; (4) *Semaeophyllum* Vollbrecht MS in Wedekind (1927, p. 12); (5) *Desmophyllum* Wedekind (1927, p. 76), *non* Ehrenberg; (6) *Neocystiphyllum* Wedekind (1927, p. 77); (7) *Lamprophyllum* Wedekind. From the figures it seems that *Aulacophyllum* of Wedekind is a synonym of *Pycnactis*. *Plasmophyllum* of Lang and Smith (1927, p. 458), *non* Dybowski (see Lang, Smith and Thomas, 1940, p. 101) is a synonym of *Lamprophyllum*. All of the others might well be synonyms of *Phaulactis*, but it is difficult to take full account of the generic value of the differences described by Wedekind without examination of his actual material. The criteria on which he relies are the manner and position in which the thickened parts of the septa thin during ontogeny, and the nature of the tabulae (complete or incomplete), which occupy the resultant spaces.

In the Australian Silurian, the family is represented by *Hercophyllum* Jones, remarked below.

Goniophyllum Edwards and Haime (1850, p. lxix) from the Wenlock of England and the Gotlandian of Gotland may be a member of the family, as it has the characteristic septal structure, and an arrangement of horizontal skeletal elements sometimes found in Phaulactids—deeply concave tabular floors. The new Australian genus *Baeophyllum* described herein may be related to *Lamprophyllum*, and it is doubtfully regarded as a member of the Pycnactidae.

Possibly the Entelophyllidae are related to the Pycnactidae, as is suggested in the discussion on p. 411 below.

Genus Hercophyllum Jones.

Jones, 1936, p. 53. *Genotype, Cyathophyllum shearsbyi* Sussmilch, 1914, fig. 143. Upper Silurian, Yass district.

Diagnosis.—Large, solitary Rugose corals; the septa are attenuate in the dissepimentarium, but dilated at first in the tabularium, the dilatation decreasing from the axis outwards during ontogeny, with one early reversal; the major septa reach or almost reach the axis, and are gently curved; the tabularium is wide, with gently domed tabular floors, usually of large tabellae; the dissepiments are small and regular, frequently geniculate.

Remarks.—This genus resembles the other Pycnactidae in having the septal dilatation confined to those parts within the tabularium. Jones has considered a difference in the way this dilatation of the septa decreases during the ontogenies of the two genotypes to be of generic value. In *Phaulactis cyathophylloides* the

dilatation decreases from the counter quadrants first, and then gradually towards the cardinal septum; but in *H. shearsbyi* the decrease is general, from the axis outwards, with a reversal (a slight increase) early in ontogeny. These differences are of the same order as those distinguishing Wedekind's five genera, considered above as possible synonyms of *Phaulactis*. Since, however, *H. shearsbyi* has a rather wider tabularium than the European Pycnactidae, and a constant domed arrangement of the large tabellae, it seems convenient to retain *Hercophyllum* as a genus separable from *Phaulactis*, at least until a re-investigation is made of the Gotland specimens, although Lang, Smith and Thomas (1940, p. 67) have regarded them as synonyms.

HERCOPHYLLUM SHEARSBYI (Sussmilch). Plate xii, figs. 8, 9.

Cyathophyllum shearsbyi, nom. nud., Etheridge, 1904, p. 288.—*C. shearsbyi* Sussmilch (ex Etheridge MS.), 1914, fig. 143, facing p. 44. Limestone Ck., Bowning district. Silurian.—*Phaulactis shearsbyi* (Sussmilch), Hill, 1935, p. 507, fig. 18*d*.—*Hercophyllum shearsbyi* (Sussmilch), Jones, 1936, p. 54, Pl. v, figs. 1*a–g*; Pl. vi, figs. 1*a–g*; Pl. vii, figs. 1*h–i*, 2.

Holotype, specimen figured Sussmilch, *loc. cit.*, in Newcastle Technical College Collection.

Diagnosis as for genus.

Remarks.—The species and its ontogeny have been fully described by Jones, *loc. cit.* The diameter may be as great as 50 mm.; there are from 50 to 55 septa of each order in large specimens, the minor being half to two-thirds as long as the major. The species is almost identical morphologically with *Lycophyllum westergardi* Wedekind (1927, p. 72, Pl. 22, figs. 5–7) from the Stricklandinia marls of Visby, which are uppermost Llandovery or lowest Wenlock in age.

I figure on Plate xii, figs. 7*a*, *b*, sections from F 17236 (Australian Museum), in which there is an exceptionally narrow tabularium, in which the axial ends of the major septa are dilated and are continuous vertically, suggesting that the individual belongs to a different species of the genus. As, however, *H. shearsbyi* is exceptionally variable, and this is the only specimen I have showing these characteristics, I refer it provisionally to the group of *H. shearsbyi*. F 12734 and F 17235 (Australian Museum) also show a rather narrow tabularium, but the axial ends of the major septa are thin as in typical adult corallites. All three specimens are from Hatton's Corner.

Localities.—Silurian. Limestone Ck., Bowning; Silverdale; Derrengullen Ck., Bowning; Barrandella shales and Hume Limestone, Hatton's Corner, Yass R.; mouth of Euralie Ck., Yass R.; Quedong, Co. Wellesley; Glenbower anticline, near Boambolo Crossing, Murrumbidgee R.; Spring Ck., near Mt. Canoblas, Co. Ashburnham.

Chapman (1920, p. 183, Pl. 18, fig. 7; Pl. 19, fig. 9) records the species from Native Dog Ck. and Cowombat Ck., Limestone Ck. district, Eastern Victoria, but his figures are inconclusive. The specimen from Wellington (University of Queensland Collection F 3173) referred to by Jones (1936, p. 55), is possibly a species of *Digonophyllum* Vollbrecht (1926) and may be compared with *D. schluteri* Wedekind (Vollbrecht, 1926, Pl. xiv, fig. 4) from the base of the Couvinian of the Eifel.

Genus BAEOPHYLLUM, n. gen.

(*Baeos*, deep, in reference to the tabulae.)

Genotype, Baeophyllum colligatum, n. sp., Silurian, Bowspring Limestone, Yass R.

Diagnosis.—Fasciculate Rugose corals with septa partly lamellar, partly of separate trabeculae; with complete or incomplete concave tabulae, and shallow dissepiments.

Remarks.—The relations of this genus are uncertain. The separation of the trabeculae in parts of the septa is known elsewhere only in *Rhizophyllum*. The concave complete and incomplete tabulae are like those of *Disphyllum panicum* (Winchell) from the Middle Devonian of America, but the dissepiments are rather shallow for the Disphyllidae. Both tabulae and dissepiments resemble those of an undescribed species of *Lamprophyllum* Wedekind from the Wenlock limestone of Wenlock Edge, and because of this resemblance the genus is here placed doubtfully with the Pycnactidae. A comparison of *B. colligatum* with other foreign species is given under remarks on the species.

Baeophyllum colligatum, n. sp. Plate xii, figs. 10–12.

Holotype, Australian Museum specimen F 9148, with sections AM 704. Silurian, Bowspring Limestone, Boonoo Ponds Ck., Hatton's Corner, Yass R., N.S.W.

Diagnosis.—*Baeophyllum* with connecting processes and with minor septa short or suppressed.

Description.—The corallum is phaceloid, the corallites being connected by processes. The individual corallites are 5 or 6 mm. in average diameter; the maximum diameter is 7 mm., but corallites smaller than 4 mm. are frequent; the type of increase is not known. The major septa extend about two-thirds of the way to the axis, leaving a clear space there; they are about 30 in number in the larger corallites, and are unequally developed, some being lamellar and others consisting wholly or partly of separate trabeculae, whose width is the same as that of the lamellar septum. The minor septa are very short, or, more usually, are suppressed. They also may be of separate trabeculae, or lamellar. The tabularium is about 3 mm. wide. The tabulae are concave, some being complete, but highly inclined, incomplete plates are added to these to form a peripheral series. As seen in transverse sections the intersections of the tabulae are frequently geniculate. The dissepiments are shallow, rather large, horizontally inclined at the periphery, and more steeply inclined in the inner series; usually only two series are developed. The dissepimentarium is seldom more than 1 mm. wide, except where connecting processes occur. The connecting processes are outgrowths of the dissepimentarium from one corallite, which grows till it touches but does not pierce the epitheca of a neighbour.

Remarks.—The separate trabeculae have the appearance of the spines of *Cystiphyllum*. A transverse section figured by Wedekind (1927, Pl. 2, figs. 11, 12) from the Ludlovian of Gotland as *Entelophyllum fasciculatum* Wedekind, somewhat resembles *B. colligatum*, but no vertical section and no description of internal structure is given. The vertical section figured by Lambe (1901, Pl. x, fig. 3) from the Niagaran (Clinton or Lockport) of l'Anse de la Barbe, Quebec, as *Amplexus cingulatus* Billings, is identical with that of our species.

Localities.—In addition to the type locality, the species occurs in the Bowspring limestone at Hatton's Corner, Yass R., and in the limestone at the junction of Euralie Ck. and Yass R. (Por. 161, Parish of Yass). Silurian (Wenlock or Ludlow).

Family Rhabdocyclidae.

Acanthocyclidae, Hill, 1936, p. 193. Typical genus, *Rhabdocyclus* Lang and Smith, 1939, p. 152, nom. nov. for *Acanthocyclus* Dybowski, 1873, preoccupied.

Rugose corals with acanthine septa and complete tabulae, and without dissepiments.

Range.—Silurian and Lower Devonian.

Remarks.—I have included in this family only the Upper Valentian and Wenlock *Palaeocyclus* and *Rhabdocyclus*, the Upper Valentian *Cantrillia* and the Wenlock, Ludlow and Lower Devonian *Tryplasma*. In the three last-named genera, the trabeculae are rhabdacanths or holacanths with the proximal parts embedded in lamellar sclerenchyme which is continuous round the corallum. In *Palaeocyclus* the trabeculae are monacanths. I have considered *Rhabdocyclus* to be directly derived from *Palaeocyclus* by evolution of the trabeculae, and *Tryplasma* to be evolved from *Rhabdocyclus* by the development of tabulae. Bassler (1937), however, has united *Palaeocyclus* and *Rhabdocyclus* with all the other discoid or patellate Rugosa in the Family Palaeocyclidae.

The Mycophyllidae may have arisen from the Rhabdocyclidae. They also are without dissepiments, and have rhabdacanthine septa; but the lamellar sclerenchyme which is present is not continuous round the corallum, that of each septum being separate.

Genus Tryplasma Lonsdale.

Lonsdale, 1845, p. 613.—*Pholidophyllum* Lindstrom, 1870–71, p. 925. Genotype, *Cyathophyllum loveni* Edwards and Haime, 1851, p. 364, Gotlandian of Gotland, which is *Tryplasma*.—*Acanthodes* Dybowski, 1873, p. 364, with five genosyntypes from the Gotlandian of Gotland or the Borkholm beds of Estland, all *Tryplasma* spp.—*Spiniferina* Penecke, 1894, p. 592, nom. nov. for *Acanthodes* Dybowski. Penecke included Lower Devonian *Tryplasma* spp.—*Aphyllostylus* Whiteaves, 1904, p. 113. Genotype, *A. gracilis* Whiteaves, *id.*; for figure see Whiteaves, 1906, Pl. 24, figs. 1, 1*a*. Niagaran of Stonewall, Manitoba.—*Aphyllum* Sochkina, 1937, p. 45, p. 94. Monotype, *A. sociale* Sochkina, *id.*, Pl. vii, figs. 1–4. Wenlock, Eastern slopes of the Urals.—*Tryplasma*, Lang and Smith, 1927, p. 461; Hill, 1936, p. 204.

Genolectotype (chosen Lang and Smith, *loc. cit.*), *Tryplasma aequabile* Lonsdale, 1845, p. 613, 633, Pl. A, figs. 7, 7*a*. Silurian. River Kakva, near Bogoslovsk (east of the Northern Urals).

Diagnosis.—Simple or fasciculate Rugose corals with a narrow peripheral stereozone of rhabdacanthine, holacanthine or dimorphacanthine septa in continuous lamellar sclerenchyme, the trabeculae being free distally; with complete tabulae, and no dissepiments.

Remarks.—The earliest record of *Tryplasma* is from the Borkholm (Upper Ordovician or more probably Valentian) beds of Estland. It is very common in the Gotlandian of Gotland, the Silurian of Russia, the Wenlock and Ludlow of England, the Niagaran of America, the Silurian and Lower Devonian of New South Wales, and the Lower Devonian of Styria, the Eastern Urals, and New South Wales. It is frequently associated with similar fasciculate forms without dissepiments and with complete tabulae, but in which the septa are amplexoid and not acanthine; in the Silurian such forms have usually been called *Pycnostylus*, and in the Devonian, *Amplexus*; they are probably homeomorphic and not related to *Tryplasma*.

Aphyllum sociale Sochkina appears to resemble *Tryplasma rugosum* very closely, with extremely short holacanths for septa, set in a narrow peripheral stereozone.

TRYPLASMA LONSDALEI Etheridge. Plate xii, figs. 13, 14.

Etheridge, 1890, p. 15, Pl. i, figs. 1–6. Silurian, [Hatton's Corner] Yass [R.].—Etheridge, 1907, p. 77, Pl. x; Pl. xi, figs. 2–4; Pl. xii, fig. 1; Pl. xix, fig. 4; Pl. xxv, fig. 5; Pl. xxvi, figs. 1–7; Silurian, Yass District and Wellington District.—? *T. lonsdalei* var. *scalariformis* Etheridge, 1907, p. 80, Pl. xii, figs. 2, 3; Pl. xiv, fig. 4; Pl. xxiv, figs. 7, 8, 8*a*; Pl. xxv, figs. 1–4; Pl. xxvi, figs. 8–10; *partim*. Silurian, Yass, Bowning, Jenolan, Wellington and Molong Districts.—*T. lonsdalei* var. *minor* Etheridge, 1907, p. 81, Pl. xvi, figs. 3, 4; Pl. xxiv, fig. 9; Pl. xxv, figs. 6, 7; Pl. xxvi, fig. 11; *partim*. Silurian, Yass district, i.e. the lectotype, here chosen, F 8502, Australian Museum, Scarp, Yass R., Portion 161, Par. Yass, figured Etheridge, *loc. cit.*, Pl. xxiv, fig. 9, Pl. xxv, fig. 6.—? *T. dendroidea*, Hill, 1937, p. 151, *non T. dendroidea* Etheridge, 1907.

Lectotype (here chosen), F 35512, Australian Museum, Silurian, Hatton's Corner, Yass R., figured Etheridge, 1890, Pl. i, figs. 2–5.

Diagnosis.—Phaceloid *Tryplasma* with corallites 6 mm. in average diameter, with connecting processes.

Description.—The corallum is sub-phaceloid, its long cylindrical corallites diverging very slightly, and the corallum may be more than 150 mm. in height. The corallites are of an average diameter of 6 mm., and are frequently in contact or connected by processes. In some coralla the average diameter may be 8 mm., and in others 4 mm. Increase is axial or peripheral, two, three, or four subequal corallites arising; in axial increase the new corallites may remain in contact for a short distance; but in peripheral increase they usually diverge immediately. The diameter of a corallite increases slightly just before offsets are produced, and at the issue of a connecting process. There are 20 to 30 major septa extending from one-third to half-way to the axis, alternating with an equal number of minor septa which are shorter and thinner than the major septa. Both major and minor septa are acanthine, the distal ends of the trabeculae being free. The trabeculae are rhabdacanths and the width of the peripheral stereozone in which they are set is no greater than the thickness of a major septum. The rhabdacanths of a septum are in contact proximally, and free distally. The tabulae are complete, flat or sagging, sometimes with a median notch. They vary in distance apart from 1 to 2 mm. There are no dissepiments.

Remarks.—Etheridge placed in the variety *scalariforme* specimens from the Molong, Wellington, Jenolan and Nemingha districts, and from Euralie Ck., Boambolo and Limestone Ck. in the Yass district, which had uniformly larger and more parallel corallites, of average diameter 8 mm., in which groups of closely-spaced tabulae were absent, and two, three or four buds occurred, instead of the two considered characteristic of *T. lonsdalei*, *s.s.* But all these characters are variable in *T. lonsdalei*, and should the specimens showing them possess rhabdacanthine septa, then they are best regarded as *T. lonsdalei*. I have examined those of his syntypes from the Yass district that are at present available, and am unable to find rhabdacanthine septa in them. They appear to have lamellar septa, which would be diagnostic for *Pycnostylus*, but they are all rather re-crystallized, and for the present I place them doubtfully with *T. lonsdalei*. It is considered unwise to choose a lectotype for the variety *scalariforme* until the syntypes from the Molong and Wellington districts have been sectioned.

It seems to me that the individuals placed by Etheridge in *T. lonsdalei* var. *minor* differ from the typical *lonsdalei* only in those characters which are very variable in *lonsdalei*, such as diameter of corallites, spreading nature of the

corallum, and number and position of origin of the offsets in the calice, and that a separation of such forms from *lonsdalei* can neither reasonably nor usefully be maintained.

The specimen described by McCoy (1847, p. 228) from Curradulla or Limestone Ck.* as *Amplexus arundinaceus* Lonsdale, which I previously regarded as *Tryplasma dendroides*, has the rhabdacanthine septa of *T. lonsdalei*, not the amplexoid septa of the lectotype of *Pycnostylus dendroides* which I have since examined. Its diameter is however larger than that found in *T. lonsdalei*.

TRYPLASMA DELICATULUM Etheridge. Plate xii, figs. 17*a*, *b*.

T. delicatula Etheridge, 1907, p. 82, Pl. xxii, fig. 9; Pl. xxiii, figs. 6, 7. Silurian, north bank, Yass R., Por. 126, Par. Yass.—*Lectotype* (here chosen), F 8725, Australian Museum, with slides AM 742, figured Etheridge, *loc. cit.*

Diagnosis.—Phaceloid *Tryplasma* with corallites 1·5 to 3 mm. in diameter, with 15 major and 15 minor septa.

Description.—The corallum is phaceloid, the corallites being long, cylindrical and straight or slightly flexuous, close, united laterally by their walls or by connecting processes. They are from 1·5 to 3 mm. in diameter. The epitheca shows longitudinal ridges and transverse growth striation. The peripheral stereozone is narrow and the holacanthine septa are extremely short (less than 1 mm. long), the major extending a little further beyond the stereozone than the minor. There are usually 15 major septa and 15 minor septa. Holacanths may be developed on the tabulae, which are distant, frequently with a median notch.

Remarks.—The species is close to *T. flexuosum* (Linnaeus) from the Gotlandian of Gotland, and the Wenlock of England, but has slightly more septa, 30 at a diameter of 3 mm. as against 22 at the same diameter in the European form. The other Australian phaceloid *Tryplasma* has almost 40 septa in those few of its corallites which are as small as 3 mm. in diameter, and their septa are rhabdacanthine, not holacanthine.

TRYPLASMA DERRENGULLENENSE Etheridge. Plate xii, fig. 16.

T. derrengullenensis Etheridge, 1907, p. 88, Pl. xxii, figs. 5–8; Silurian, Limestone Ck., near Bowning. *Lectotype* (here chosen), F 9789, Australian Museum, figured Etheridge, *loc. cit.*, fig. 8.

Diagnosis.—Solitary, trochoid or ceratoid *Tryplasma*, with irregular rejuvenescence, and a very deep calice.

Description.—The corallum is solitary, and trochoid at first, later with frequent rejuvenescence so that the various rejuvenescence calices do not exceed the original in diameter, but each grows at an angle from the preceding, and the corallum is irregular. The epitheca shows longitudinal double ridges, the fine furrows opposite the minor septa, and the deeper ones opposite the major septa. The calice is very deep, and bears numerous spines in vertical series, each series representing a septum. Those of the major septa are larger than those of the minor septa. Rootlets may be present. There are about 40 septa of each order at a diameter of 15 mm., the greatest observed in the species. The major septa may be 2 mm. long. The septa are rhabdacanthine, the rhabdacanths being free distally, but having their bases set in lamellar sclerenchyme continuous round the wall, thus forming a peripheral stereozone. The tabulae are complete and

* My reference 1937, p. 151, to the age of the beds in Limestone Ck. as Silurian or Lower Devonian was due to Devonian specimens from Cavan being sent to me wrongly labelled Limestone Ck.

horizontal, sometimes with a median notch. They may be distantly or closely placed in the one corallite, and frequently bear small spines on their upper surfaces.

Remarks.—*T. derrengullenense* is extremely close to and may indeed be synonymous with *Tryplasma loveni* (Edwards and Haime) from the Wenlock of England and the Gotlandian of Gotland. The Australian form is perhaps a little slenderer, with somewhat more irregular rejuvenescence.

Family Spongophyllidae.

Hill, 1939*a*, p. 58.

Range.—Upper Silurian of the Baltic States, Bohemia and New South Wales, Lower Devonian of Styria and France, and Middle Devonian of Europe and Australia.

Genus Spongophyllum Edwards and Haime.

Edwards and Haime, 1851, p. 425; Jones, 1929, p. 88; Hill, 1939*a*, p. 60.—*Genotype* (by monotypy), *Spongophyllum sedgwicki* Edwards and Haime, *loc. cit.*, 1853, p. 242, Pl. lvi, figs. 2, 2*a–e*. [Middle] Devonian [or Frasnian], Torquay.

Diagnosis.—Cerioid Rugose corals in which the tabularium is narrow and the tabulae close and slightly concave, the minor septa are degenerate, and lonsdaleoid dissepiments may be developed in an irregular peripheral zone when the major septa are discontinuous.

Remarks.—The genus as interpreted by Hill, *loc. cit.*, contains five Upper Silurian and six Middle Devonian species.

Spongophyllum shearsbii Chapman. Plate xiii, figs. 1, 2.

Chapman, 1925, p. 113, Pl. xiv, figs. 18*a*, *b*.; Pl. xv, figs. 25, 26. Silurian, Hatton's Corner, Yass R.—Jones, 1932, p. 51, Pl. iii, figs. 1, 2; Pl. iv, fig. 1.

Holotype, specimen, figured by Chapman, *loc. cit.*, in the National Museum, Melbourne.

Diagnosis.—*Spongophyllum* with corallites 5 mm. in diameter, with thick walls; the major septa are long and usually perfect, and the minor septa usually discontinuous; lonsdaleoid dissepiments are rare; tabularium narrow, with complete, sagging tabulae.

Remarks.—The species has been adequately described by Chapman, *loc. cit.*, and Jones, *loc. cit.* Its thick walls and the general absence of lonsdaleoid dissepiments are very characteristic.

Localities.—Bowspring limestone, Hatton's Corner, Yass R., and Boonoo Ponds Ck., near Yass; shales above Bowspring limestone, Hatton's Corner, near Yass. Silurian.

Spongophyllum spongophylloides (Foerste). Plate xiii, figs. 3–5.

Endophyllum (*spongophylloides*?) Foerste, 1888, p. 132, Pl. xiii, figs. 16, 17; coralline limestone, Silurian, Bowning.—*Lonsdaleia*? (*Spongophyllum*) *bipartita* Etheridge, 1889, p. 22, Pl. iii, figs. 1–5; Humewood, near Yass. Silurian.—*Spongophyllum bipartitum* (Etheridge), Chapman, 1925, p. 114.—*S. spongophylloides* (Foerste), Jones, 1932, p. 52, Pl. iii, figs. 3, 4.

Holotype, specimen, figured by Foerste, *loc. cit.*, now in the British Museum (Natural History).

Diagnosis.—*Spongophyllum* with large corallites 10 to 16 mm. in diameter, in which the 18 to 20 major septa and alternating minor septa are withdrawn from

the periphery; with thin walls, a wide lonsdaleoid dissepimentarium, and narrow tabularium with close, complete, sagging tabulae.

Remarks.—Jones (*loc. cit.*) has already given an adequate description, and has noted that, of the described species of *Spongophyllum*, *S. spongophylloides* is closest to the Wenlock (E_2) *S. inficetum* Počta (1902, p. 153, Pl. 102, fig. 1) from Bohemia; but it is larger, has a wider dissepimentarium, and more septa than the Bohemian form.

Localities.—Bowspring and Barrandella limestones, Hatton's Corner, Yass R.; Derrengullen Ck. and Limestone Ck., near Bowning; Bowning; Humewood Lead Mine, near Yass. Silurian.

Genus Yassia Jones.

Jones, 1930, p. 36.—*Crinophyllum* Jones, 1932, p. 61, *nom. nov. inval.*—*Genotype*, *Spongophyllum enorme* Etheridge, 1913, p. 35, Pls. iv–vii; Silurian; escarpment north-east of Boonoo Ponds Ck., Hatton's Corner, Yass R.

Diagnosis.—Cerioid Rugose corals with septa developed only as crests on the dissepiments and tabulae; tabulae complete, shallowly saucered; dissepiments very large, steeply inclined near the axis.

Remarks.—Only the genotype is known; the stability of the tabularium is noteworthy; in most lineages, when the septa are lost, the tabularium merges with the dissepiments, and is hard to distinguish. In *Yassia*, however, the two are quite distinct. The genus is here regarded as a member of the Spongophyllidae in which the loss of the septa is complete. The characters of both dissepiments and tabulae support this classification.

Yassia enormis (Etheridge). Plate xiii, figs. 6*a*, *b*.

Spongophyllum enorme Etheridge, 1913, p. 35, Pls. iv–vii.—*Yassia enormis* (Etheridge), Jones, 1930, p. 36, vide supra.—*Crinophyllum enorme* (Etheridge), Jones, 1932, p. 61, Pl. iv, figs. 2, 3.

Lectotype (here chosen), F 8572, Australian Museum, figured Etheridge, *loc. cit.*, Pl. iv. Silurian, escarpment north-east of Boonoo Ponds Ck., Hatton's Corner, Yass R.

Diagnosis as for genus.

Remarks.—The species has been adequately described by Etheridge, *loc. cit.*, and Jones, *loc. cit.* The corallites are very large, 20 to 40 mm. in diameter, the tabularium occupying nearly one-third of this. Only the type species is known. In addition to the type locality, it occurs in the Bowspring limestone of Hatton's Corner, Yass R.

Family Streptelasmidae.

Hill, 1940, p. 164.

Range.—Upper Ordovician and Silurian of America and Europe; Silurian of Australia; Lower Devonian of France; Middle Devonian of North America and Australia.

Genus Streptelasma Hall.

Streptoplasma [sic] Hall, 1847, pp. 17, 49, 69.—*Streptelasma* Hall, 1847, explanation to Pl. iv.—*Palaeocyathus* Foerste, 1888, p. 129. Genosyntypes, *Turbinolopsis bina* Lonsdale, Phillips, 1841; *Zaphrentis caudata* Ludwig, 1865–6; and *Cyathophyllum australe* Foerste, 1888, p. 128. Genolectotype, chosen Lang, Smith and Thomas, 1940, p. 94, *Cyathophyllum australe* Foerste, described below.—*Streptelasma*, Smith, 1930, p. 311; Cox, 1937, p. 2; Hill, 1940, p. 165.

Genolectotype, *Streptoplasma* (sic) *corniculum* Hall, 1847, p. 69, Pl. 25, figs. 1*a–d*. Trenton formation of Trenton Falls, etc., New York State. See Cox, *loc. cit.*

STREPTELASMA AUSTRALE (Foerste). Plate xii, figs. 18–23.

Cyathophyllum australe Foerste, 1888, p. 128, Pl. xiii, figs. 12–14.

Lectotype (here chosen), R 26519, British Museum (Natural History), figured Foerste, *loc. cit.* Hardened grey-brown shales east of Bowning Hill. Silurian. Collected by John Mitchell.

Diagnosis.—Small trochoid *Streptelasma* in which the axial structure is weak and the septa are straight so that the cardinal fossula is difficult to distinguish.

Description.—The corallum is solitary and broadly or slenderly trochoid, usually slightly curved. The broadest corallite seen had a maximum diameter of 25 mm., attained in a height of 25 mm., and the smallest, a diameter of 8 mm. in a height of 11 mm. The calice is extremely deep, as much as two-thirds the height of the corallum, with a long, sloping border and a flattened axial portion. The epitheca shows weak growth annulation, and very shallow longitudinal furrows corresponding in position with the septa. The cardinal septum is on the longest side of the corallum. There are 20 lamellar septa of each order in the calical border when the maximum diameter of the calice is 10 mm. (Foerste's holotype), and 25 of each order in a transverse section of 10 mm., just below the base of a much wider calice. The septa are straight; they are never attenuate, but are more dilated in the early stages than in the later. The major septa are unequal, reaching almost to the axis; their axial ends may be a little swollen, and those of two neighbours are frequently joined. They are denticulate, so that a weak axial structure is formed, which is distinct enough in vertical section, but not very obvious in transverse section. It is difficult or impossible to distinguish either cardinal septum or cardinal fossula from the arrangement of the septa. The minor septa are very short, and are dilated to form a peripheral stereozone 0·5 to 1 mm. wide, with the dilated peripheral ends of the major septa. The tabulae are distant, complete and domed, broken by the septa and their denticulations.

Remarks.—The holotype of *Cyathophyllum australe* Foerste is a specimen difficult to interpret (H. D. Thomas *in litteris*). It appears to be partly calical mould and partly solid, affected by weathering. It is unsuitable for sectioning, but its septa are lamellar, not acanthine, rather long, extending well towards the axis. It seemed very likely that the specimens from Rainbow Hill and Bellevale (Phacops bed) used for the diagnosis and description given above, are conspecific with it. I sent specimens to Dr. Thomas to be compared with the type, and he reports that in his opinion they are conspecific. It may be that two species are present in the trochoid coralla of the Phacops bed. In two specimens, the lumen is almost completely filled with sclerenchyme, apparently by dilatation of the septa. However, Smith (1930, p. 312) has described similar great dilatation in the young stages of a Valentian Streptelasmid, and it may be that these two specimens are of the same species as the others, but still retain in the adult stage thickening which in the others died away very early. The number and arrangement of the septa correspond fairly well, 27 as against 25 major septa at a diameter of 10 mm., but it is not clear whether their axial edges are denticulate.

Family ENTELOPHYLLIDAE.

Typical Genus, *Entelophyllum* Wedekind.

Compound Rugose corals with long major septa typically ending at a loose axial structure of incomplete tabulae, and with numerous small, globose dissepiments.

Range.—Gotlandian of Gotland and Oesel, Upper Silurian of Norway, ? Llandovery, Wenlock and Ludlow of England, Wenlock of Scotland, Wenlock of Bohemia, Niagaran of America and Upper Silurian of Australia.

Remarks.—The following genera may be related to *Entelophyllum*:

Petrozium Smith (1930, Pl. xxvi, figs. 20–28) from the Upper Llandovery of England is a small phaceloid form with long septa, globose dissepiments, and tabulae arranged in an axial structure. It may well be a member of the family.

Weissermelia Lang, Smith and Thomas (1940, p. 111), nom. nov. for *Ptilophyllum* Smith and Tremberth (1927, p. 309), preoccupied, from the Ludlow of Gotland is fasciculate, with carinate septa, but the incomplete tabulae are arranged in concave platforms: it also has rather larger dissepiments than typical *Entelophyllum* though from the figures these seem to resemble the peripheral dissepiments of the Australian Upper Silurian *E. yassense* and the American Niagaran *E. rugosum*.

Cyphophyllum Wedekind (1927, p. 20) from the Wenlock of Gotland, contains solitary corals with the axial structure and septal arrangement of *Entelophyllum*, but the septa are frequently discontinuous with the occurrence of lonsdaleoid dissepiments. The genus is probably a member of the Entelophyllidae.

Phaulactis near *angusta* Lonsdale (Smith, 1930, Pl. xxvii, figs. 1–4) is a solitary coral from the Upper Llandovery of England, which, from the arrangement of its tabulae, appears to have closer relation to *Entelophyllum* than to *Phaulactis*.

Lang and Smith (1927, p. 457) considered that *Entelophyllum* gave rise to *Codonophyllum* Wedekind by septal dilatation, so that *Codonophyllum* might perhaps be regarded as a member of the family. It is not impossible that the Entelophyllidae are related to the Pycnactidae, and that they might be regarded as a sub-family of the latter. The chief difference is in the nature of the dilatation of the septa. In the Entelophyllidae this affects the septa in the dissepimentarium, but in the Pycnactidae those parts in the tabularium are the ones dilated.

Genus Entelophyllum Wedekind.

Wedekind, 1927, p. 22.—*Xylodes* Lang and Smith, 1927, p. 461; Smith and Tremberth, 1929, p. 362; Smith, 1933, p. 513, genotype by designation, *Madreporites articulatus* Wahlenberg. *Xylodes* is pre-occupied by Waterhouse, 1876, for a recent coleopteron.

Genolectotype (chosen Lang, Smith and Thomas, 1940, p. 57): *Entelophyllum articulatum* Wedekind, 1927, pp. 22, 24 = *Xylodes articulatus* (Wahlenberg) Smith and Tremberth, 1929, p. 363, Pl. vii = *Madreporites articulatus* Wahlenberg. Upper Silurian, Gotland.

Diagnosis.—Compound Rugose corals typically with peripheral parricidal increase, long thin septa of which the major reach, or nearly reach, the axis, an axial structure of axial tabellae surrounded by concave periaxial tabellae, and numerous, small, globose dissepiments.

Remarks.—European species are three—the genotype, with attenuate septa, from the Wenlock and Ludlow of England and the Wenlock of Bohemia in addition to the type locality; *Entelophyllum pseudodianthum* (Weissermel), with carinate, dilated septa, from the Wenlock, both having the typical axial structure, and a cerioid species from the Upper Silurian of Norway (Smith and Tremberth, 1929, Pl. viii, fig. 1). The American Niagaran species, *E. rugosum* (Smith) (1933,

p. 516) has complete tabulae and no axial structure, and a peripheral series of rhombic dissepiments. The Australian Silurian *E. yassense* (Etheridge) has a peripheral series of rhombic dissepiments, and an axial structure. The internal structure of the Australian *E. latum*, n. sp. is very similar to that of the genotype. I have seen a cerioid form from Bungonia, New South Wales.

ENTELOPHYLLUM YASSENSE (Etheridge). Plate xiii, figs. 11, 12.

Heliophyllum yassense Etheridge, 1892, p. 170, Pl. xi, fig. 8, Pl. xii, figs. 1–3. [Silurian] Near Yass.—*Xylodes yassense* (Eth. fil), Jones, 1936, p. 56, Pl. vii, figs. 3, 4, possibly *non* fig. 5.

Type material missing, possibly in Geological Survey of N.S.W. collection.

Diagnosis.—Entelophyllum with carinate septa, minor septa withdrawn from the inner margin of the dissepimentarium, and with a peripheral series of rhomboid dissepiments.

Description.—The corallum is fasciculate, spreading in a wide cone from the first corallite, increase being peripheral and unequal, the larger part of the parent corallite being unaffected and continuing with the growth of the parental tabularium; this non-parricidal peripheral increase may perhaps better be regarded as a modification of lateral increase. The coralla may be very large, one observed in Limestone Creek being several feet in height and diameter. The size of the corallites is very variable, from long sub-cylindrical to short, broadly trochoid. The broadest individual corallite observed was 50 mm. in diameter, the longest 80 mm. in height; usually, however, increase takes place before such a size is attained. Owing to the nature of the increase the corallites are frequently sinuously oval in transverse section. The calice has a broad, flat platform, and a shallow axial pit in which four fossulae may be distinguished, just outside the axis, one, the cardinal, being much deeper.

There are two orders of attenuate septa, both carinate, the carinae being lateral outgrowths from the trabeculae, irregularly arranged on either side of the septa, running parallel to the trabeculae—i.e., upwards, curving inwards. The septa in the larger corallites are very crowded—in the corallite 50 mm. in diameter more than 200 septa were counted; in another of 30 mm. diameter, there were 126; 30 were present in a corallite of 6 mm. diameter. In most corallites the septa are straight for a distance of 1 mm. from the epitheca, i.e. opposite the outermost series of dissepiments; inside this they are rather sinuous. The major septa are very long, extending almost to the axis, but leaving there a space about 2 mm. in diameter, into which usually two opposite longer septa, the counter and the cardinal, project. Near their axial edges the two major septa neighbouring the cardinal septum are slightly curved, outlining a small fossula in the tabularium. The minor septa seldom extend the full width of the dissepimentarium; they are unequal; their axial ends may curve towards the neighbouring major septum on the counter side. The tabulae are arranged in axial and periaxial series of incomplete plates; the periaxial series is of slightly saucered plates; the axial series forms a loose axial structure, the outermost plates being globose and the inner flattened or sagging. The width of the tabularium varies with the width of the corallite, from 6 to 10 mm. The dissepiments are in two distinct groups—the peripheral group of one or two series is of rhomboid dissepiments—with a long horizontal or slightly inclined peripheral part (as seen in vertical section) and a globosely curved inner part. In transverse section these plates are geniculate. The inner group of dissepiments occupies the rest of the

dissepimentarium, which in large corallites may be very wide; they are typically small, globose and slightly inclined; but occasionally the place of several may be taken by a single, long, shallow, gently inclined plate.

Remarks.—This species differs from the Wenlock and Ludlow English and Baltic *E. articulatum* and *E. pseudodianthum* in the nature of the increase, for the tabularium of the parent continues as the tabularium of the largest product; while in the European forms the increase is parricidal. *E. yassense* also has a peripheral series of rhomboid dissepiments, unknown in the European forms, but which, from the figures given by Smith (1933, Pl. i, figs. 8–11) appears to occur in the American Niagaran *E. rugosum*; it differs from *E. rugosum* in that its tabulae form an axial structure, while in *E. rugosum* the tabulae are usually complete and horizontal. Its septa are carinate as in *E. pseudodianthum*. It differs from the forms placed in the Gotlandian *Cyphophyllum* by Wedekind in not having lonsdaleoid dissepiments. As the species does not resemble very closely any other known member of the genus, its age can only be deduced as between the known limits of occurrence of the genus, Wenlock and Ludlow of Europe and Niagaran of America.

Localities.—Hatton's Corner, Yass R., in the Barrandella shales and the Hume limestone. Derrengullen Ck., Silverdale, Barber's and Limestone Cks., near Bowning. Rainbow Hill, near Yass. Silurian.

ENTELOPHYLLUM YASSENSE var. PATULUM (Foerste). Plate xiii, figs. 13*a*, *b*.

Cyathophyllum patula Foerste, 1888, p. 129, Pl. xiii, figs. 9–11. Lower trilobite bed, Bowning. Silurian.

Type material untraced, possibly in the British Museum.

Diagnosis.—Patellate *E. yassense*, solitary, or increasing once only, by peripheral increase.

Description.—The corallites are patellate and vary in dimensions; one was 10 mm. tall, 35 mm. broad in one diameter, and 29 mm. broad at right angles to this; another was 8 mm. tall, and 42 × 34 mm. in diameter. The apex is excentric, so that the corallites are slightly curved. They are usually solitary, but one was observed in which an offset was produced by parricidal peripheral increase from the parent. In calical characters and internal structure the variety resembles *E. yassense*.

Remarks.—This variety occurs in beds higher in the succession than the species; its typically solitary mode of growth, and the fact that when increase occurs it is parricidal, distinguish it from the earlier species. It may be that it should be regarded not as a variety but as a forma, but since *patula* was an earlier name than *yassensis*, this would make taxonomic difficulties; and as *patula* appears to have a stratigraphical value, it is herein regarded as a variety.

Localities.—In addition to the type locality, the variety occurs in the Hume limestone of Hatton's Corner, Yass R. Silurian.

ENTELOPHYLLUM LATUM, n. sp. Plate xiii, figs. 8–10.

Holotype, F 8973, Australian Museum Collection, collected by Shearsby, 1903, from the Silurian anticline at Glenbower, near the Boambolo crossing of the Murrumbidgee River, N.S.W. There is a second specimen from the same locality, F 8974, and three others, F 9548–9550, from the contorted shales west of the crossing, collected by Shearsby, 1904.

Diagnosis.—*Entelophyllum* with numerous thin septa and with axial structure so wide as almost to fill the tabularium.

Description.—Only broken individuals have been collected, so that it is not known whether the corallum is phaceloid or solitary. They vary in diameter from 12 to 20 mm., and appear to be slowly expanding. At a diameter of 18 mm. there are 40 major and 40 minor septa, both thin and closely-spaced, the minor septa extending a little beyond half-way to the axis, and the major continuing to or almost to the axis, with more or less rotation noticeable. In the tabularium the tabellae are arranged in a wide axial structure in which there is a circumferential series of plates which are domed and horizontally based, separated from the dissepimentarium by small plates inclined outwards, and surrounding wide plates which are shallowly concave. The dissepiments are very small, regular and rather globose.

Remarks.—The specimens from the contorted shales show septa thickened and with carinae, while those from the anticline have smooth, thin septa. The species is close to *Entelophyllum articulatum* (Wahlenberg) from the Wenlock and Ludlow of Europe, differing in having more septa and a wider axial structure.

Rugosa incertae sedis.

Genus Zenophila, n. gen.

(*Zenophila*, a heroine in the poems of Meleager.)

Genotype, *Phillipsastraea walli* Etheridge. Silurian, Yass District.

Diagnosis.—Plocoid Rugose corals with small, distant tabularia surrounded by an aureole of regularly radial septal segments; with horizontal or concave tabulae, and shallowly arched dissepiments.

Remarks.—The genus, which contains only the type species, bears a superficial resemblance to the only other figured Silurian plocoid genus, *Arachniophyllum* Dana, which is characteristic of the Wenlock Limestone of England, the Niagaran of America and the Silurian of Gotland. *Arachniophyllum*, however, always shows a peculiar septal modification, by which at recurrent levels in the corallum the septa are represented in the dissepimentarium by a rectilinear network continuous over the surfaces of the dissepiments (see Lang and Smith, 1927, p. 453). It also has an axial structure, where the axial edges of the septa meet the conically arranged tabellae. *Zenophila* shows no trace either of this septal modification or of an axial structure. *Phillipsastraea silurica* Lahusen (Weissermel, 1894, p. 611) from the Upper Silurian of Estland is not sufficiently known for a comparison to be made with it; when Etheridge wrote, all plocoid corals of any Palaeozoic period were placed in *Phillipsastraea*. *Z. walli*, however, has none of the characteristics of the Disphyllidae, to which *Phillipsastraea*, *s.s.* belongs. It has shallowly arched dissepiments, in contrast to the rather globose plates of the Disphyllidae, it shows none of the septal modifications of the Disphyllidae, and its tabularium is not of a type known in the Disphyllidae. I know of no genus which might be considered related to *Zenophila*.

Zenophila walli (Etheridge). Plate xiii, figs. 14–17.

Phillipsastraea walli Etheridge, 1892, p. 169, Pl. xi, fig. 7, Silurian, Yass district.—*non P. walli*, Chapman, 1914, p. 305, Pl. xlviii, figs. 7–9, Lower Devonian, Loyola, which (Hill, 1939, p. 238) is *Phillipsastraea* sp. indet.

Type material missing, possibly in Geological Survey of N.S.W. collection.

Diagnosis.—*Zenophila* with dissepimental platforms sagging between the tabularia, and a series of horizontally based dissepiments near the inner margin of the dissepimentarium.

Description.—The corallum is plocoid and spreading, and may be large, one incomplete specimen being 20 × 18 × 7 cm. Neighbouring corallites are never separated by a dividing wall; they are either thamnastraeoid (when the septa of neighbouring corallites are confluent) or aphroid (when the peripheral parts of the septa have been developed and the corallites are joined by dissepiments only). Th axes oi the corallites are usually from 5 to 10 mm. apart, not very regularly spaced. There are 10 to 12 major septa, extending nearly to the axis; one may be longer than the others; or sometimes a second and nearly opposite septum may also be very long. Minor septa are imperfectly continuous, occurring as crests or segments of variable length; some may be quite absent in any corallite —but in such a case the remaining septa are arranged so that all interseptal loculi are approximately equal. The major septa are always quite straight and radial at the junction between the tabularia and dissepimentaria, but outside this zone they may curve suddenly or gradually, to become confluent with septa from neighbouring corallites, or they may not be formed at all, so that the corallum is aphroid. In some coralla all the septa are attenuate; in others they may be dilated; and in one they are represented, in a fairly narrow zone round the tabularia, by discontinuous trabeculae about 0·05 mm. in diameter, set in a scanty cloudy mass of sclerenchyme; the trabeculae however are not arranged in a rectangular pattern as in *Arachniophyllum*; they appear to be in rows parallel to the course of the septum, but no rows can be seen normal to these, as is characteristic of *Arachniophyllum*. The tabulae are complete, and either sagging or horizontal; the dissepiments are rather flatly curved; the innermost series is highly inclined, but immediately around this is a zone of horizontally based plates; outside this again, the dissepiments are arranged in a sagging curve, the deepest part of the sag being at the approximate junction of two corallites.

Remarks.—The species is known only from the Silurian of Yass and Bowning districts, from the Barrandella shales and Hume limestone of Hatton's Corner, Yass R., the Scarp, Yass R., north bank, Por. 126, Par. Yass, and from Limestone and Derrengullen Cks.

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EXPLANATION OF PLATES XI-XIII.

Plate xi.

Figures × 1·5 approx., except otherwise indicated.

Fig. 1.—*Pycnostylus guelphensis* Whiteaves. Section of topotype, F 3458, University of Queensland Collection; Guelph (? Lower Ludlow), Hespeler, Ontario.

Fig. 2.—*Pycnostylus congregationis* (Etheridge). Syntype, F 8768, Australian Museum Collection; Silurian, Barber's Ck., off Derrengullen Ck., near Bowning, N.S.W. 2*a*, transverse section, AM 732; 2*b*, vertical section, AM 650.

Fig. 3.—*Pycnostylus dendroides* (Etheridge). Transverse section (AM 649) of syntype F 8898, Australian Museum Collection.

Figs. 4-10.—*Rhizophyllum interpunctatum* de Koninck. 4, External view of calical mould, × ¾; F 4279, University of Queensland Collection, Yass R. Silurian.—5, Transverse section, Sydney University Collection; Silurian, Barrandella shales, Hatton's Corner, Yass R.—6, Transverse section, Sydney University Collection; Silurian, Barrandella shales, Hatton's Corner, Yass R.—7, Transverse section, F 3822, University of Queensland Collection, Barrandella shales, Silurian, Hatton's Corner, Yass R.—8, Vertical section, F 3823, University of Queensland Collection, Silurian, Barrandella shales, Hatton's Corner, Yass R.—9, Vertical section, Sydney University Collection, Silurian, Barrandella shales, Hatton's Corner, Yass R.—10, Tangential vertical section, Sydney University Collection, Silurian, Barrandella shales, Hatton's Corner, Yass R.

Fig. 11.—*Rhizophyllum robustum* Shearsby. Sections from F 26872, Australian Museum Collection, Silurian, Limestone Ck., near Bowning; *a*, transverse, *b*, vertical.

Fig. 12.—*Rhizophyllum yassense* Shearsby. External views, approximately × ¾, of the holotype, F 37055, Australian Museum Collection, Silurian, shales in Derrengullen Ck. at the junction with Limestone Ck., near Bowning; *a*, side; *b*, calical, showing the crescentic opening.

Fig. 13.—*Cystiphyllum* sp. cf. *bohemicum* Pocta. Sections from F 3554, University of Queensland Collection, Silurian, Bowspring Limestone, Hatton's Corner, Yass R. *a*, transverse; *b*, vertical.

Fig. 14.—*Holmophyllum multiseptatum*, n. sp. Sections from the holotype, F 1023, University of Queensland Collection, Cliftonwood, near Yass, Silurian. *a*, transverse; *b*, vertical.

Figs. 15-17.—*Disphyllum praecox*, n. sp. 15, Sections AM 744 from F 9719 (Australian Museum Collection); Silurian, Por. 161, Par. Yass (Station 108, Yass R.), N.S.W. *a*, transverse; *b*, vertical.—16, Sections AM 745 from F 9709, the holotype, Australian Museum Collection; Silurian, shale in Limestone Ck., 50 yards below the Bowning-Wargeila road crossing. *a*, transverse; *b*, vertical.—17, Sections from F 9879, Australian Museum Collection; Silurian, Limestone Ck., Bowning District.

Figs. 18-19.—*Mycophyllum liliiforme* (Etheridge). 18, Transverse section from near base of cup, 6184, Sydney University Collection; Silurian, Bowspring Limestone, Derrengullen Ck., Yass. See Pl. xii, fig. 6*b*.—19, Tangential section through septa of cup, F 3810, University of Queensland Collection; Silurian, Derrengullen Ck., Yass.

Plate xii.

Figures × 1·5 approx., unless otherwise indicated.

Figs. 1-2.—*Mycophyllum crateroides* (Etheridge). 1, External view, F 8296, Australian Museum Collection; Silurian, Hatton's Corner, Yass R. × slightly less than ¾.—2, Vertical section AM 797 from F 5170, Australian Museum Collection; Silurian, Yass.

Figs. 3-6.—*Mycophyllum liliiforme* (Etheridge). 3, Surface of vertical cut through F 3808, University of Queensland Collection; Silurian, Derrengullen Ck., Yass R.; shows at the top a section through a possible operculum. × ¾.—4, Surface of vertical cut through a typically patellate calice, 6180, Sydney University Collection; Silurian, Hatton's Corner, Yass R. The thinness of the calical wall distinguishes the species from *crateroides*. A young corallite is sectioned on each calical wall. × less than ¾.—5, Vertical section AM645 from F 8896, Australian Museum Collection; Silurian, Barber's Ck., off Derrengullen Ck., Yass R.—6*a*, Transverse section through a fragment, 6183, Sydney University Collection, which may be stem of *M. liliiforme*, or *Pycnostylus* sp.; Bowspring Limestone, Derrengullen Ck., Yass R.—6*b*, Vertical section through a fragment, 6184, Sydney University Collection, which may be stem of *M. liliiforme*, or *Pycnostylus* sp. Bowspring Limestone, Derrengullen Ck., Yass R. See Pl. xi, fig. 18.

Fig. 7.—*Hercophyllum* aff. *shearsbyi* (Sussmilch). Sections from F 17236, Australian Museum Collection; Silurian, Hatton's Corner, Yass R. *a*, transverse; *b*, vertical.

Figs. 8-9.—*Hercophyllum shearsbyi* (Sussmilch). 8, Transverse section, F 4200, University of Queensland Collection; Silurian, Hatton's Corner, Yass R.—9, Vertical section, F 4203, University of Queensland Collection; the broken line shows the probable unweathered outline; Silurian, Hatton's Corner, Yass R.

Figs. 10-12.—*Baeophyllum colligatum*, n. gen. et sp. 10, Sections from F 3779, University of Queensland Collection; Silurian, Derrengullen Ck., Yass R. *a*, transverse; *b*, vertical.—11, Vertical section AM 625, from F 8642, Australian Museum Collection; Silurian, Limestone at mouth of Euralie Ck., Por. 161, Par. Yass (Station 108, Yass R.).—12, Sections AM 704 from the holotype, F 9148, Australian Museum Collection; Silurian,

Bowspring Limestone, Boonoo Ponds Ck., near Hatton's Corner, Yass R. *a*, transverse; *b*, *c*, vertical.

Figs. 13-15.—*Tryplasma lonsdalei* Etheridge. 13, Sections from F 3851, University of Queensland Collection; Silurian, Derrengullen Ck., Yass R. *a*, transverse; *b*, *c*, vertical.—14, Vertical section AM 600 from syntype F 8502, Australian Museum Collection; Silurian, NE bank of Yass R., Por. 126, Par. Yass (Station 106, Yass R.).—15, Sections AM 726 from syntype F 8643, Australian Museum Collection, of *T. lonsdalei* var. *scalariforme* Etheridge. It is impossible to decide from this section whether the specimen is *Tryplasma* or *Pycnostylus*, owing to excessive recrystallization. Silurian, Limestone at mouth of Euralie Ck., Yass R.

Fig. 16.—*Tryplasma derrengullenense* Etheridge. External views, polished transverse surface, F 9793, and polished tangential surface, F 9794, Australian Museum Collection; Silurian, Limestone Ck., Bowning. × 3. Note vertical rows of dots representing septal spines.

Fig. 17.—*Tryplasma delicatulum* Etheridge. Sections AM 742 of the lectotype F 8725, Australian Museum Collection; Silurian, north bank of Yass R., Por. 126, Par. Yass (Station 106, Yass R.). *a*, transverse; *b*, vertical.

Figs. 18-23.—*Streptelasma australe* (Foerste). 18, External view of the lectotype R 26519, British Museum (Natural History); Silurian, hardened grey-brown shales east of Bowning Hill, Coll. J. Mitchell. The specimen is in part calical cast and in part skeleton.—19, Vertical section of F 3530, University of Queensland Collection; Silurian, Phacops beds, Rainbow Hill, Yass.—20, Transverse section of F 3523, University of Queensland Collection; Silurian, Phacops beds, Rainbow Hill, Yass.—21, Transverse sections from thickened specimen, F 3531, University of Queensland Collection; Silurian, Dalmanites bed, Bellevale, near Yass.—22, Transverse sections from F 3533, University of Queensland Collection; Silurian, Dalmanites bed, Bellevale.—23, Transverse section through the calice of F 3534, University of Queensland Collection; Silurian, Dalmanites bed, Bellevale.

Plate xiii.

Figures × 1·5 approx. unless otherwise indicated.

Figs. 1-2.—*Spongophyllum shearsbii* Chapman. 1, Transverse section of F 3838, University of Queensland Collection; Silurian, Derrengullen Ck., Yass, N.S.W.—2, Vertical section F 3837, University of Queensland Collection; Silurian, Bowspring Limestone, Hatton's Corner, Yass R.

Figs. 3-5.—*Spongophyllum spongophylloides* (Foerste). 3, Transverse section F 3842, University of Queensland Collection; Silurian, Derrengullen Ck., Yass R.—4, Transverse section F 3841, University of Queensland Collection; Silurian, Derrengullen Ck., Yass R.—5, Vertical section of F 3651, University of Queensland Collection; Silurian, Barrandella Limestone, Hatton's Corner, Yass R.

Fig. 6.—*Yassia enormis* (Etheridge). Sections from F 1046, University of Queensland Collection; Silurian, Bowspring Limestone, Hatton's Corner, Yass R. *a*, transverse; *b*, vertical.

Figs. 8-10.—*Entelophyllum latum*, n. sp. 8, Transverse section from F 9549, Australian Museum Collection; Silurian, contorted shales west of Boambolo Crossing, Murrumbidgee R., N.S.W.—9, Vertical section from F 9550, Australian Museum Collection; Silurian, contorted shales west of Boambolo Crossing, Murrumbidgee R., N.S.W.—10, Sections from the holotype F 8973, Australian Museum Collection; Silurian, anticline near Boambolo Crossing, west bank, Murrumbidgee R. *a*, transverse; *b*, vertical.

Figs. 11-12.—*Entelophyllum yassense* (Etheridge). 11, Sections, AM 677 from F 8846, Australian Museum Collection; Silurian, Barber's Ck., Derrengullen Ck., near Bowning. *a*, transverse; *b*, vertical.—12, Sections from F 15917, Australian Museum Collection; Silurian, shale below limestone, Rainbow Hill, near Yass. *a*, transverse; *b*, vertical.

Fig. 13.—*Entelophyllum yassense* var. *patulum* (Foerste). External views of F 9778, Australian Museum Collection; Silurian, Limestone Ck., near Bowning, N.S.W. *a*, proximal; *b*, distal; the match and shadow indicate how patellate the corallite is. Approx. × 3.

Figs. 14-17.—*Zenophila walli* (Etheridge). 14, Transverse section of F 3877, University of Queensland Collection; Silurian, Derrengullen Ck., Bowning district.—15, Sections from F 6694 (Geological Survey of N.S.W.) now in Australian Museum Collection; Silurian, Derrengullen Ck. *a*, transverse; *b*, vertical.—16, Sections from F 463, Australian Museum Collection; Silurian, Yass. *a*, transverse; *b*, vertical.—17, Transverse section from F 3876, University of Queensland Collection; Silurian, Derrengullen Ck.

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